Complexity and Leadership: Conceptual and Competency Implications

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Dissertation presented for the degree of Doctor of Philosophy in the Faculty of Economic and Management Sciences (School of Public Leadership) at Stellenbosch University

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December 2011

DECLARATION

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Abstract

Globalisation, rapid changes in technology, and demographic trends are all important factors that contribute to conditions that require adaptive capacity in military organisations. The context of a majority of military operations is often asymmetric with blurred boundaries, and military organisations are expected to master a wide range of operations from humanitarian disaster relief to more regular warlike situations in a joint- and multinational framework.

The complexity of the challenges facing military leaders in contemporary and future operations makes it relevant to develop *a meta-competency model for leadership in complex military systems*, which is the main purpose of this dissertation.

A Complexity Approach represents a shift from a set of conservative laws to a perception of the world as an open and highly dynamic system, and some characterise complexity as a bridge between modernism on the one hand and post-modernism on the other. Complexity and complex systems have a number of characteristics, some of them being a large number of short-ranged interactions that are dynamic, non-linear and fairly rich. Another significant feature of complexity is the emphasis on *emergent patterns* that are codetermined through a dynamic process between the history of the system and the interaction with its local environment.

Leadership in complex systems might be described by the *dynamics of emergence*, not merely by incremental influence, and increasingly considered to be a collective social phenomenon. A complexity-oriented leader acts as an *enabler* of a rich identity interacting in richly constrained play of difference, facilitating "bounded" individual and systemic adaptive capacity.

The reigning paradigm in military organisations, however, are closely linked to an autocratic and bureaucratic structure and a fundamental quest for control, equilibrium and stability, all of which are deeply embedded in Newtonian Principles of linearity, reductionism and determinism. The investigation of empirical research on Norwegian Military Officers and the Norwegian Armed Forces reveal a considerable amount of homogenous force substantiating stability and control, at the same time as complexity and uncertainty are acknowledged.

This dissertation argues that the definition of competencies as *"an underlying characteristic of an individual that is causally related to effective and/or superior performance in a job or situation"*, is not suitable for a complexity understanding and proposes competencies to be defined as "*interconnected underlying characteristics of an individual or system, which*

through a dynamic and non-linear process of interaction between local agents and the environment contribute to the emergence of identifiable or unidentifiable patterns of individual or systemic behaviour".

Based on a synthesis of a non-empirical literature study, empirical research and a model-building study, this dissertation suggests that *heterogeneity of degree, androgynousity, cognitive flexibility, ethical reasoning, cross-cultural competence, intuition, identity and courage*, are necessary meta-competencies for leadership in complex military systems. It is further argued that these meta-competencies must be interpreted as interconnected and interdependent, and the metaphor of a cloud is therefore presented as a suitable image of the intricate dynamics of complexity.

Opsomming

Globalisering, vinnige veranderinge in tegnologie en demografiese tendense is belangrike faktore wat bydra tot toestande wat aanpassingsvermoë in militêre organisasies vereis. Die konteks waarin 'n meerderheid militêre operasies hul bevind is dikwels asimmetries met onduidelike grense, en daar word van militêre organisasies verwag om 'n wye verskeidenheid krygsverrigtinge van humanitêre rampverligting tot meer gereelde oorlogsugtige omstandighede in 'n gesamentlike en multinasionale kader te bemeester.

Die kompleksiteit van die uitdagings waarvoor militêre leiers te staan kom in huidige en toekomstige krygsverrigtinge is dit gepas om *'n meta-bevoegdheidsmodel vir leierskap in komplekse militêre stelsels* te ontwikkel, wat die belangrikste doel van hierdie tesis is.

'n Kompleksiteitbenadering verteenwoordig 'n verskuiwing van 'n stel konserwatiewe wette na 'n waarneming van die wêreld as 'n oop en hoogsdinamiese stelsel, en kompleksiteit word soms gekenmerk as 'n brug tussen modernisme aan die een kant en die post-modernisme aan die ander. Kompleksiteit en komplekse stelsels het 'n aantal kenmerke, waarvan sommige van hulle 'n groot aantal kortafstandinteraksies wat dinamiese, nie-lineêre en redelik ryk is. Nog 'n belangrike kenmerk van kompleksiteit is die klem op die *ontluikende patrone* wat vasgestel word deur middel van beide 'n dinamiese proses tussen die geskiedenis van die stelsel en die interaksie met die plaaslike omgewing.

Leierskap in komplekse stelsels kan beskryf word deur die *dinamika van verskyning,* nie net deur inkrementele invloed nie, en al hoe meer beskou as 'n kollektiewe sosiale verskynsel. 'n Kompleksiteitgeoriënteerde leier dien as 'n *instaatsteller* van 'n ryk identiteit wat wisselwerking uitoefen in streng beperkte verskilspel, wat "begrensde" individuele en sistemiese aanpassingsvermoë fasiliteer.

Die huidige paradigma in die militêre organisasies word egter nou gekoppel aan 'n outokratiese en burokratiese struktuur, en 'n fundamentele soektog vir beheer, ewewig en stabiliteit, waarvan almal diep in Newtoniaanse Beginsels van lineariteit, reduksionisme en determinisme vasgelê is. Die ondersoek van empiriese navorsing oor die Noorse Militêre Offisiere en die Noorse Weermag openbaar 'n aansienlike aantal homogene mag wat stabiliteit en beheer staaf, terselfdertyd as wat kompleksiteit en onsekerheid erken word.

Hierdie tesis is van mening dat die definisie van vaardighede as *"'n onderliggende eienskap van 'n individu wat oorsaaklik verwant is aan doeltreffende en/of superieure prestasie in 'n beroep of situasie"*, nie geskik is vir 'n kompleksiteitbegrip nie en stel voor dat vaardighede gedefinieer word as *"onderling verbinde onderliggende eienskappe van 'n individu of stelsel,*

wat deur middel van 'n dinamiese en nie-lineêre proses van interaksie tussen plaaslike agente en die omgewing bydra tot die verskyning van identifiseerbare of nie-identifiseerbare patrone van individuele of sistemiese gedrag".

Gebaseer op 'n sintese van 'n nie-empiriese literatuurstudie, empiriese navorsing en 'n bou van modelle studie, stel hierdie tesis voor dat die *heterogeniteit van graad*, *androgienisme*, *kognitiewe buigsaamheid*, *etiese beredenering*, *kruis-kulturele bevoegdheid*, *intuïsie, identiteit en moed*, nodige meta-vaardighede vir leierskap in komplekse militêre stelsels is. Dit voer verder aan dat hierdie meta-vaardighede vertolk moet word as onderling verbinde en onderling afhanklik is, en die metafoor van 'n wolk word dus voorgestel as 'n geskikte beeld van die ingewikkelde dinamika van kompleksiteit.

Acknowledgement

The content of this paper is the fault of the generosity of my friends, family and in particular my beloved wife Maria, the variety and richness of life and the inspiration and competence of my strong willed - yet humble - supervisor, Professor Erwin Schwella.

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Chapter 1: Introduction

"Kick off your mental shoes, and let your minds stray out of the boxes into which we normally find ourselves."

Ervin J. Rokke
Lieutenant General, U.S. Air Force
President, National Defense University

Technological development and globalization have significantly impacted on the emergence of an interdependent and interconnected world where the conditions for virtually any activity are in a constant and dynamic process of change. Together with new insight into the Natural- and Social sciences these macro trends facilitate novel and exciting opportunities on a wide range of areas on all levels of society (McGrew, 2005: 24; Martin, 2007: 3; Cilliers, 1998: 1).

The emerging science of complexity serves as a comprehensive starting point for the versatile discussion around the increasing complexity in today's society. Principles such as dynamism, non-linear processes, disequilibrium and emergence are aspects central to the quest for developing systems with organic and whole structures with great adaptive capacity. These principles refer to how situations emerge through a process of self-organization between locally interacting agents with often unpredictable and surprising outcomes (Fernandez, 2007: 174; Stacey & Griffin, 2005: 8; Keene, 2000: 16; Plowman et al, 2007: 342-343).

Traditionally, Newtonian Theory, which from some perspectives one may argue serves as an antagonistic metaphor to the world of Complexity Sciences, has been the prevailing paradigm for organizational life. A Newtonian way of thinking is based on the assumptions of a world characterized by reductionism, determinism and seemingly objectivity (Fernandez et al, 2007: 181- 182; Nilsson, 2007: 247), which may be linked to metaphors such as a machine or clockwork (Darwin, 2001: 483)

A Complexity Approach and a Newtonian Approach offer two rather conflicting, but simultaneously complimentary perspectives on how to perceive leadership. The traditional view of leadership, mainly based on Newtonian Principles, grows out of the assumption that organizations are equilibrium seeking systems whose futures are predictable. The

organization's actions are often rationalized and made effective by emphasizing long term planning and putting control-mechanisms in place on all levels of the organization (Plowman et al, 2007: 341). A Complexity Approach to leadership does, on the other hand, assume that organizations are operating in a far-from-equilibrium state and that future long term events are not predictable. According to complexity thinking, imposing strong control mechanisms and detailed protocols will inhibit the creative processes and the possibility of self-renewal. A traditional approach to leadership is thus of questioning relevance to the *de facto* circumstances in a complex system (Schneider & Somers, 2006: 354-355; Uhl-Bien, Marion & McKelvey, 2007: 299).

The paradigm now in use in military thinking is traditionally built on Newtonian Principles, but an increasing complexity in military operations, and perhaps the decreasing ability of military organizations to adapt to this complexity, signals a need to change the fundamental parameters along which military systems think and act (Mensch & Rahchulte, 2008: 264). Principles of bureaucracy such as standardization, formalization and authoritarian leadership skills have traditionally been some of the main pillars in a military approach to leadership which in many cases may cause dysfunctional and incomprehensive responses to complex situations.

In order to tune the military organization to the complex reality and consequently improve the ability to adapt and cope with asymmetry, a reformulation of the Officers' and military organizations' competencies is required.

1.1. Motivation for the study

A Complexity Approach opens a number of new doors for the acquisition of a novel understanding and increased knowledge of interconnected and interdependent phenomena.

Social organizations are an empirical example of such a complex phenomenon, and in a comprehensive study by IBM, complexity is defined as the CEO's primary current and futuristic challenge (IBM, 2010: 2).

Research on complexity and its application to a variety of phenomena is still a relatively new area of examination within science and new input to the Complexity Sciences is imperative for the further acquisition and development of knowledge, especially in the debate around empirical application.

The implications of a Complexity Approach to leadership have been discussed by a relatively modest number of authors and this dissertation seeks to further contribute to the general knowledge and insight into the leadership debate by discussing leadership in a complexity and military context.

Contemporary military operations in a multinational and often asymmetric framework, and large scale transformation of Armed Forces in the post-Cold War era, are highly complex processes. This dissertation has the aim of providing further awareness around how a Complexity Approach might contribute positively to the management of complex- and adaptive challenges in military organizations.

Novel Contributions

This dissertation will provide novel contribution to the emerging literature on complexity in the following way:

First of all, a novel definition of competencies will be proposed based on a complexity perception of phenomena.

Secondly, a set of meta-competencies for leadership in complex military systems will be identified through a process of synthesis which is validated against relevant complexity literature, complexity and leadership literature, characteristics of a contemporary military context and empirical evaluations of Norwegian military officers and the Norwegian Armed Forces.

Third and finally, a cloud model of interrelated and interdependent meta-competencies will be presented emphasising the symbiotic and synergetic relationship between the identified meta-competencies and the inherent provisional and unclear boundaries of the meta-competency model.

Organizational Benefits

This dissertation identifies a number of organizational benefits for the Norwegian Armed Forces' participation in the study.

- The organization will obtain feedback from the Officers concerning their perception of reality, something which might be valuable to the general development of the Officer core.
- The feedback might serve as a means of evaluating the current educational paradigm as well as a means of evaluating to what extent it incorporates a complexity perception.
- The proposed study might act as a "change-agent" for the transformation of central aspects of the Norwegian Armed Forces.

Although the proposed dissertation seeks to contribute to the emerging field of complexity on a number of areas, there are some limitations to the study. These will be discussed in the section that follows.

1.2. Limitations of the study

The meta-competency model will be developed through an emergent process based on the belief that military organizations are complex systems with implications for desired leadership competencies.

The development of this meta-model will then be kept on a general and principal level, with no recourse to the *applicability* to specific Armed Forces (countries) or different specific sub-branches. However, since the study is fundamental by nature, it is anticipated that the model will be relevant and applicable to a wide range of military- or military comparable organizations.

What has been presented above is a comprehensive discussion that serves as a basis for the formulation of the research question and research objectives.

1.3. Research Question

A Complexity Approach offers a novel framework for understanding the field of Leadership in the Social Sciences and organizational phenomena, including new thoughts and ideas on what a military organization should emphasize in order to obtain better results. The author's professional career stems from various positions in the Norwegian Armed Forces as well as an educational background in Public and Developmental Management, making the debate around complexity and military implications particularly interesting for investigation. In light of

this, and the proposed impact of Complexity Science on a vast number of areas, this research proposal finds it relevant to ask the following question:

What meta-competencies are desired in order to effectuate leadership in complex military systems?

1.4. Research Objectives

The overall intention with the proposed dissertation is to develop a meta-competency model for leadership in complex military systems.

Given the possible impact of complexity, and the theories associated with this phenomenon, some research objectives can be formulated linking complexity to essential aspects serving the purpose of the proposed dissertation.

1. Based on a non-empirical literature review, define and describe a Complexity Approach and differentiate it from what is understood by an orthodox Newtonian Theory.
2. Based on a non-empirical literature review, investigate the implications of a Complexity Approach on leadership and how it differs from the traditional characteristics of leadership.
3. Based on a non-empirical literature review, investigate the implications a Complexity Approach in military organizations.
4. Based on an empirical survey, describe and analyze Norwegian Officers' worldview against the principles of a Complexity Approach and leadership in complex systems.
5. Based on a model-building study, develop a meta-competency-model for leadership in complex military systems.

The description of the research objectives reveals multiple approaches to attain these objectives. In order to clarify these approaches, the next section will describe the research design and methodology.

1.5. Indication of Research Design and Methodology

The research designs that will be used are, as described in Mouton (2001), a non-empirical literature review based on secondary data, an empirical survey based on primary data and finally a model-building study.

Mouton (2001: 179) defines literature reviews as *"studies that provide an overview of scholarship in a certain discipline through an analysis of trends and debates".*

The empirical survey based on primary data will be materialized in the form of a survey. Mouton (2001: 152) defines surveys as "*studies that are usually quantitative in nature and which aim to provide a broad overview of a representative sample of large population".*

Model-building studies can be defined as *"studies aimed at developing new models and theories to explain particular phenomena" (*Mouton, 2001: 176).

As illustrated in figure 1, the different research designs relate to the chapters in the following way.

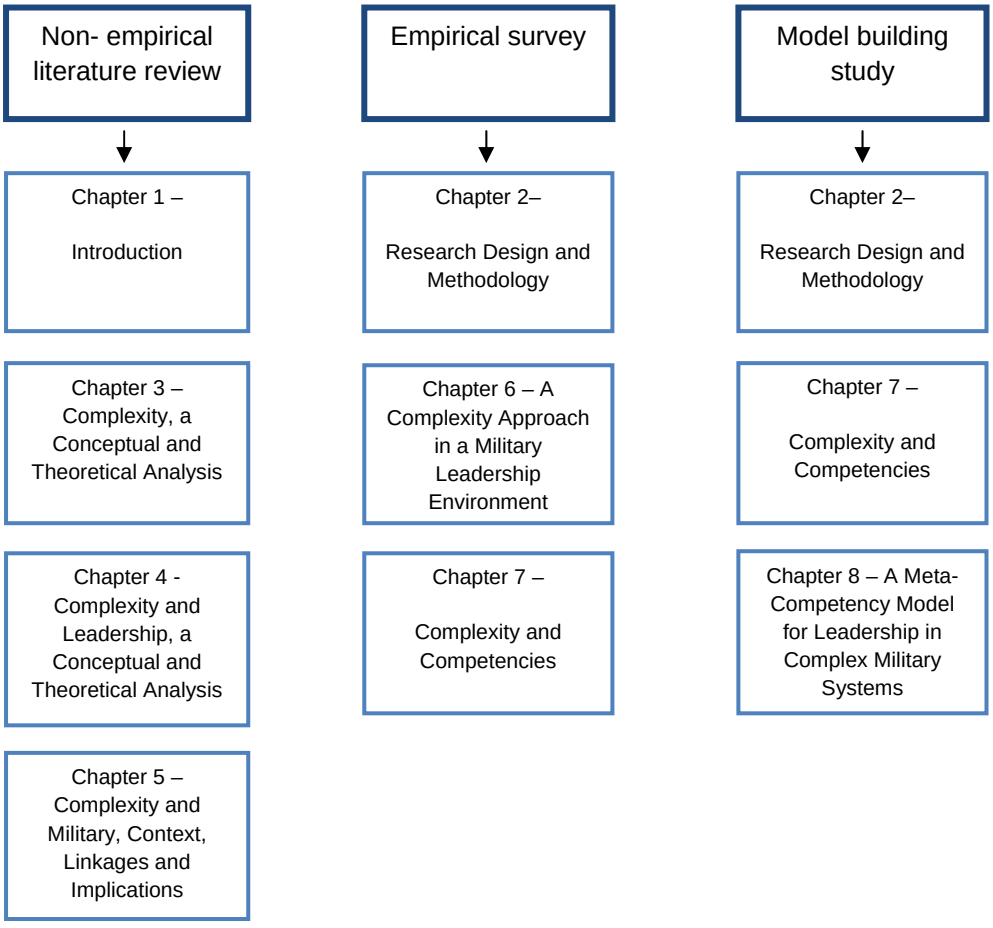


Figure 1 - Research designs

The conceptualization of the different research designs is illustrated in figure 2, conceptualization.

The theoretical point of departure in the proposed dissertation will be a Complexity Approach in a Social Sciences framework. The investigation of the properties and content of this approach will serve as a stepping-stone for the investigation of the implications of a Complexity Approach for leadership and general military activity.

The empirical survey is based on the investigation of the principles of a Complexity Approach and the implications of this approach for leadership. Together with the results from the survey conducted by Rønn (2009), where the lower level Officers' attitudes towards general Complexity Principles and leadership were investigated, the gathered data will provide sufficient data for a discussion on the *Norwegian military Officers'* attitudes towards Complexity Principles that provide a descriptive overview and normative evaluation against the meta-competency model for leadership in complex military systems.

The non-empirical literature review, the results from the empirical survey and a comprehensive discussion of competencies serve as a theoretical and empirical foundation for the development of a meta-competency model for leadership in complex military systems.

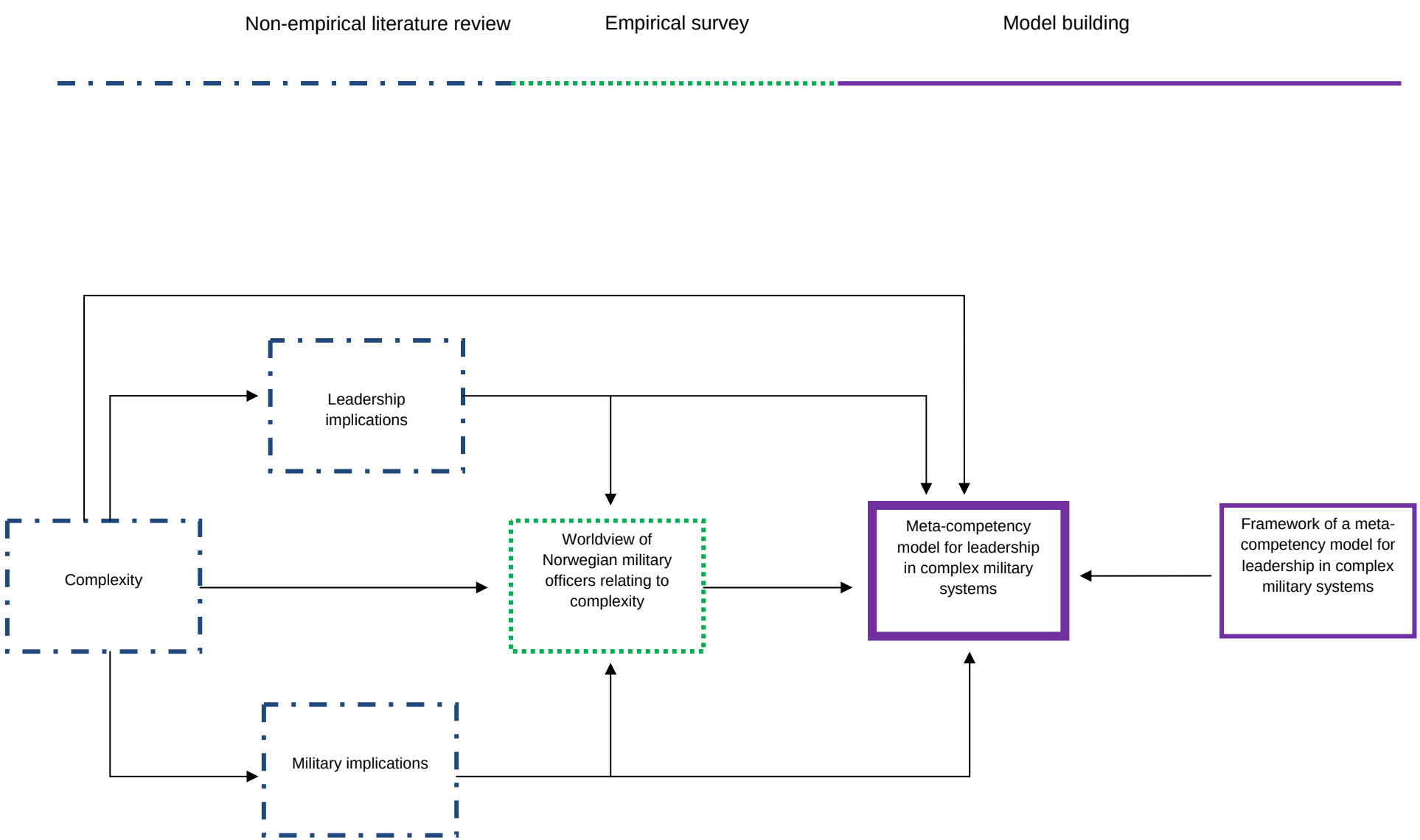


Figure 2 - Conceptualization

While the presentation of the research design and methodology provides an indication of how this dissertation will attain the research objectives, the next section will describe how this dissertation will be organized.

1.6 Research Overview

In order to reach the stated research objectives, this dissertation will organize its chapters in the following way:

Research objective 1: *To define and describe a Complexity Approach and differentiate it from what is understood by an orthodox Newtonian Theory.*

"Chapter 3 – Complexity, a Conceptual and Theoretical Analysis" reviews a Complexity Approach and how it differs from a traditional Newtonian way of thinking. This chapter starts with an initial description of how principles of reductionism, determinism and closed system thinking are the basis for a Newtonian conception of phenomena. This is followed by a discussion on different perceptions of complexity in terms of definition, research traditions and semantics. Thereafter different characteristics of complex systems are discussed. The properties of emergence, non-linearity, disequilibrium, feedback and self-organization are then discussed and argued to be necessary conditions for the emergence of complexity. Finally, the general implications of a Complexity Approach are discussed relating to the further research of this dissertation.

Research objective 2: *To investigate the implications of a Complexity Approach on leadership and how it differs from the traditional characteristics of leadership.*

"Chapter 4, Leadership, a Conceptual and Theoretical Analysis", describes the mainstream approach to leadership and the implications of a Complexity Approach for leadership. The first part of this chapter describes what may be perceived to be a traditional approach to leadership and is linked to the Newtonian Principles discussed in chapter 3 of this dissertation. The second part has four approximations relating to a Complexity Approach on leadership. The first discusses the context of complexity, the second looks as different leadership roles, the third proposes appropriate leadership behavior and fourth and finally, an empirical example of a Complexity Approach to leadership is presented.

Research objective 3: *To investigate the implications a Complexity Approach in military organizations.*

“Chapter 5 - Complexity and Military, Context, Linkages and Implications”, discusses complexity in the setting of military organizations. Initially, the current paradigm in military organizations is discussed relating to implications of a Newtonian worldview. This chapter then discusses whether or not a military organization may be characterized as a complex system. This is followed by a comprehensive discussion of general applicability of complexity to military organizations and how one can perceive war seen through the lenses of complexity. General propositions of a Complexity Approach in military organizations are then articulated followed by specific propositions relating to doctrine, strategy, structure, policy making, planning and analysis, and training.

Research objective 4: *To describe and analyze Norwegian Officers' worldview against the principles of a Complexity Approach and leadership in complex systems*

“Chapter 2- Research Design and Methodology” describes the research design and methodology for this dissertation. This chapter initially elaborates the conceptualization of this dissertation. The different research designs, i.e. literature review, empirical survey and model building study, will then be discussed in detail. Since one of the research designs is an empirical survey, the sample, measuring instrument, administering, data collection, analysis and finally possible sources of error and shortcomings will also be described.

“Chapter 6 – A Complexity Approach in a Military Leadership Environment: The case of Norwegian Military Officers”, will present the most important results from the empirical survey of this dissertation. This chapter will present and discuss different empirical trends supporting a Newtonian Approach and a Complexity Approach respectively. Furthermore, these trends will be compared with the results from Rønn (2009) and linked to relevant literature of this dissertation.

Research objective 5: *To develop a meta-competency model for leadership in complex military systems.*

This research objective is obtained as a synthesis of all the chapters of this dissertation, but the following chapters are particularly relevant.

“Chapter 7 - Complexity and Competencies: The Framework of a Meta-Competency Model for Leadership in Complex Military Systems” discusses the ramifications of the proposed meta-competency model. The first part of this chapter is dedicated to describing and discussing competency literature in terms of contemporary use of competencies and identification of what are considered to be contemporary competencies for public management/leadership. The second part of this chapter discusses competencies in the context of complexity. A pattern of homogeneity and the Norwegian military officers' relation

to complexity is further discussed in light of a broad empirical foundation. A novel definition of competencies is then proposed before this chapter finally ends with a discussion on the use of meta-competencies as guiding mechanism in a complex environment.

“Chapter 8 – A Meta-Competency Model for Leadership in Complex Military Systems” is organized in three different sections. The first section presents the identified meta-competencies and discusses their linkages to complexity literature, leadership literature, the military context and empirical evidence. The second part conceptualizes the identified meta-competency into a cloud-model emphasizing the interrelated and interdependent properties of the meta-competencies and the third and final section discusses the application the proposed meta-competency model to different contexts.

“Chapter 9 – Conclusions and Summaries” will finalize this dissertation by presenting the most important features presented throughout chapter 1 to chapter 8.

The general framework of the study has been outlined above. The following section of this dissertation elaborates on the research design and methodology.

Chapter 2: Research Design and Methodology

This chapter outlines the research design and methodology used in order to answer the research question of this study. For this purpose the description of the different research designs and their implications will be emphasized. This chapter is essential in order to meet research objective 4 and 5, which are expounded upon below:

Research objective 4: *To describe and analyse Norwegian Officers' worldview against the principles of a Complexity Approach and leadership in complex systems*

Research objective 5: *To develop a meta-competency model for leadership in complex military systems.*

In order to achieve parts of research objective 4 and 5 this chapter is divided into multiple sub-objectives:

Research objective 1.1: To describe conceptualization.

Research objective 1.2: To describe research designs.

Research objective 1.3: To describe and discuss the measuring instrument.

Research objective 1.4: To describe and discuss the sampling design, sampling methods and subject of study.

Research objective 1.5: To describe and discuss the process of data collection.

Research objective 1.6: To describe the process of administering.

Research objective 1.7: To describe and discuss the process of data-capturing and data-editing.

Research objective 1.8: To describe and discuss the process of data analysis.

Research objective 1.9: To describe and discuss possible shortcomings and sources of error.

Research objective 1.10: To summarize the most important features of this chapter.

In order to obtain the purpose of the research design and methodology this chapter will initially present the conceptualization. The conceptualization highlights a number of different approaches to be able to answer the research question. These approaches are manifested in different research designs, i.e. a literature review, a survey and a model building study. This dissertation will then continue to elaborate on different aspects of the empirical survey such

as the measuring instrument, sampling, data collection, administering, data capturing and analysis. Finally, a summary of the most important features will be provided.

2.1 Conceptualization

The purpose of this dissertation is to develop a meta-competency model for leadership in complex military systems.

Figure 3 gives an overview of the conceptualization, which for the purposes of this study is defined as the logical development of this dissertation. The link between the research objectives, the chapters and their causal relationships is further illustrated.

The non-empirical literature review which is manifested in research objective 1, 2 and 3 will through chapters 3, 4 and 5 create the foundation for the obtainment of research objective 4 and 5. Together with chapter 2, research design and methodology, chapter 7, complexity and competencies, and the non-empirical literature review, the results from the empirical survey serve as the framework for the development of a competency-model in chapter 8 (research objective 5).

The results from the empirical surveys will contribute to the development of the meta-competency model in the following ways.

1) The results give the author an understanding of the empirical and *de facto* situation concerning the Officers' attitudes towards a Complexity Approach.
2) The revealed attitudes will create a foundation for the author to easier identify the rationale behind the existence of these attitudes, and thus what processes should be emphasized to change these attitudes (and competencies).
3) The results serve as a feedback to the existing educational paradigm, which may serve as a means of comparison to the development of the competency model.

As illustrated in figure 3, there is no direct link between the military implications and the empirical survey. The reasons for this are multiple. First of all and most importantly, it is not necessary. The questions in the survey cover the military implications because the literature in this part derives from the Complexity Approach. Secondly, the questionnaire is developed not to be context specific in order to be able to use it in a non-military setting. Third and finally, in order to integrate the results from Rønn (2009) the questions must in principle be the same as in the proposed dissertation' empirical survey, or else it may not be valid and relevant.

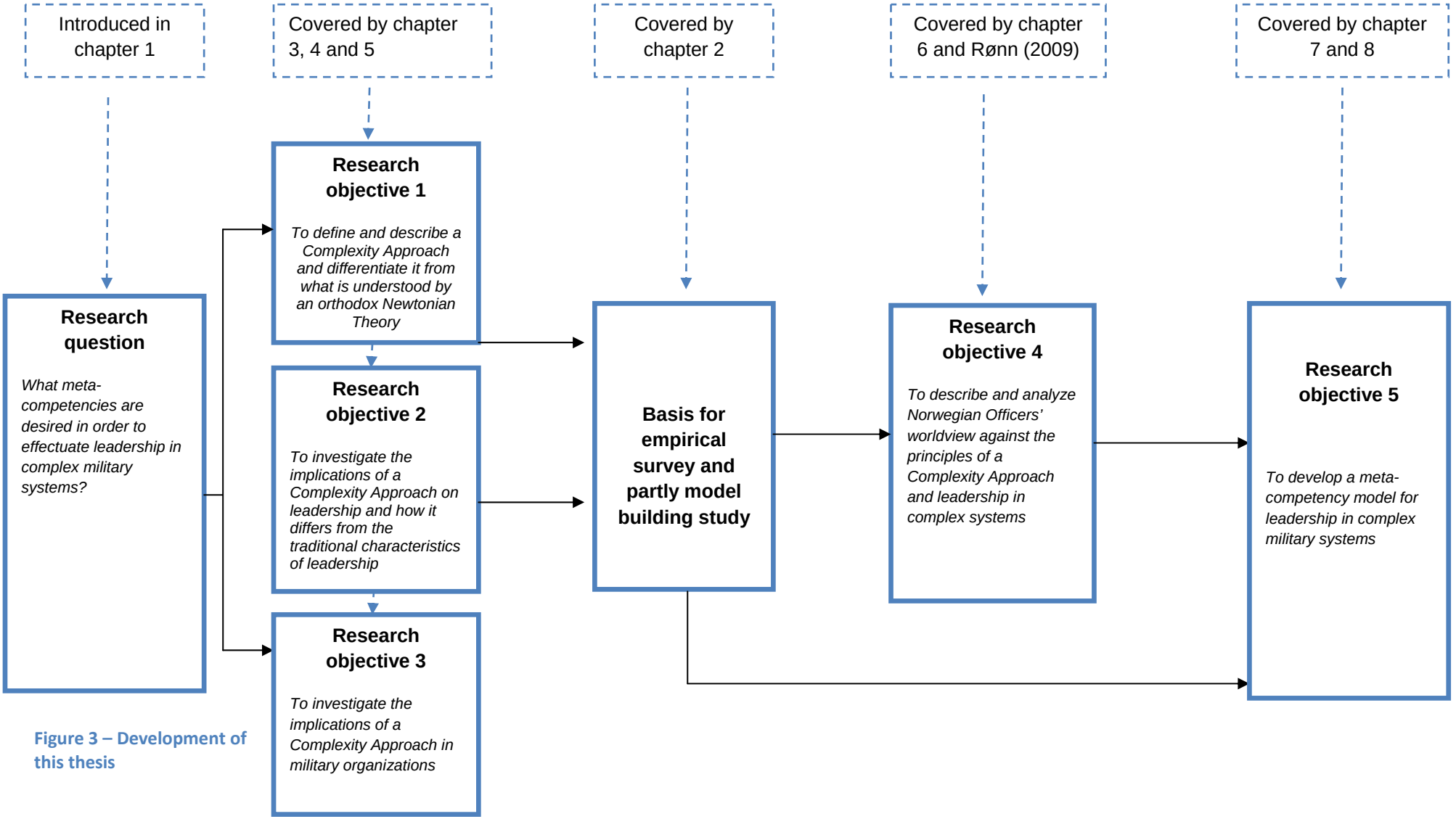


Figure 3 – Development of this thesis

As figure 3 implies, there are a number of different research designs that are necessary to incorporate in this study in order to answer the research question. The remainder of this section of the dissertation focuses on elucidation and elaboration of these research designs.

2.2 Research Designs

The research designs that will be used are, as described in Mouton (2001), a non-empirical literature review based on secondary data, an empirical survey based on primary data and finally a model-building study.

As illustrated in figure 4, the different research designs relate to the chapters in the following way.

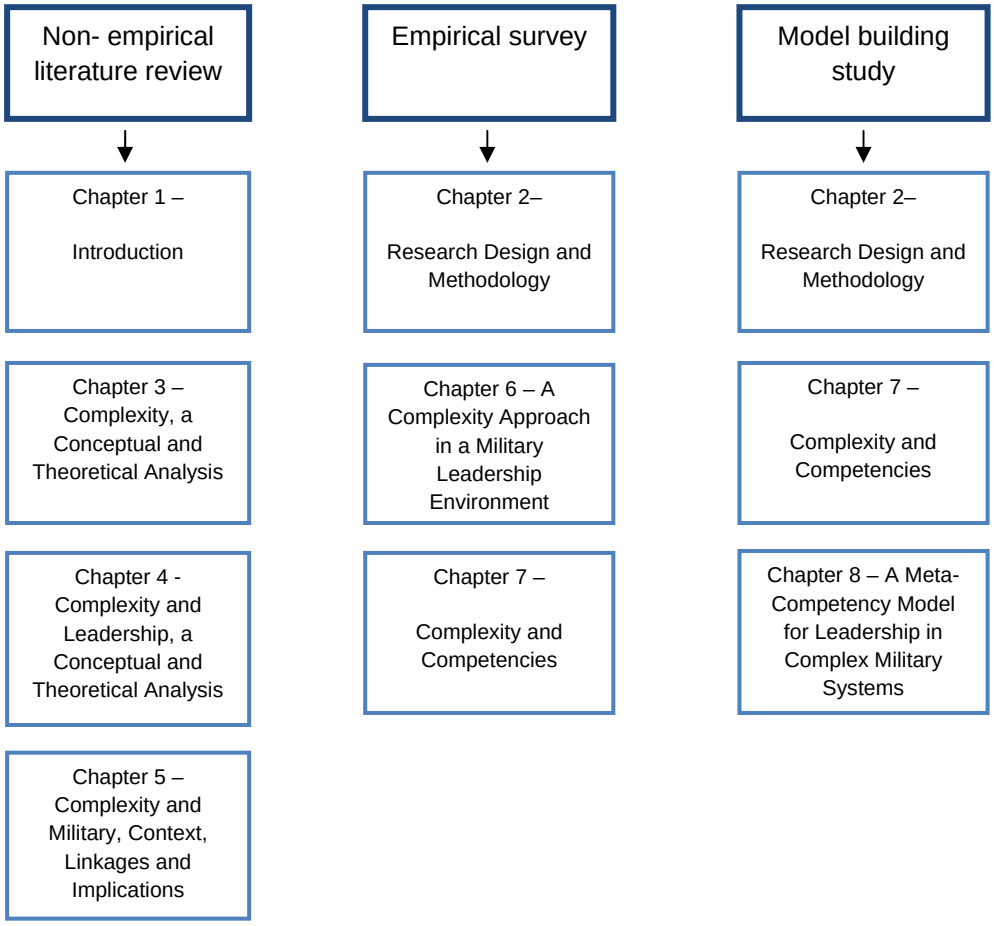


Figure 4 - Research designs

This research proposal will now continue by describing the content of the different research designs starting with empirical surveys, then continuing with non-empirical literature reviews and finally model building studies.

2.2.1 Empirical Surveys based on Primary Data

Mouton (2001: 152) defines surveys as "*studies that are usually quantitative in nature and which aim to provide a broad overview of a representative sample of large population",* which in most cases materialize as a form of questionnaires.

One of the strengths of using this design is that the measurement reliability is very high assuming a proper questionnaire construction and control functions. On the other hand, criticism for the use of this kind of design is linked to the potential pitfall of the survey data being at "surface" level and sample and context specific (Mouton, 2001: 153). It follows from this that the main sources of error according to Mouton are *"sampling error; questionnaire error; high refusal rates; high non-response; interviewer effects; respondent effects; fieldwork error; data capturing error; inappropriate selection of statistical techniques"* (Mouton, 2001: 153).

The precautions that will be taken by the dissertation in order to counteract the limitations and main sources of probable error will be presented under the different subsections of the research design and methodology, i.e. data collection, measuring instrument, sampling, administering, data capturing, analysis and finally possible shortcomings and errors.

This dissertation will now continue by describing a non-empirical literature review based on secondary data.

2.2.2 Non-empirical Literature Review based on Secondary Data

Mouton (2001: 179) defines literature reviews as *"studies that provide an overview of scholarship in a certain discipline through an analysis of trends and debates".*

The possible strengths of using this design is that it provides knowledge and insight in the area you are working on. The limitations are linked to the fact that a literature review is merely a theoretical exercise and cannot be claimed to produce new empirical insights without actually testing it through the use of primary data.

The main sources of error are according to Mouton *"selectivity in the sources; unfair treatment of authors; misunderstanding the source; selective interpretation to suit one's viewpoint; poor organization and integration of review"* (Mouton, 2001: 180).

The main means to counteract the possible limitations and sources of error are to have an ongoing dialog and discussion with prominent authors on the topic and simultaneously

control and evaluate the quality, relevance and validity of the literature against multiple sources.

The non-empirical literature review and the empirical survey make the basis for the development of the model building study, which now will be described.

2.2.3 Model Building Study

Mouton (2001: 176) defines model-building studies as *"studies aimed at developing new models and theories to explain particular phenomena".*

A prominent research design within the Social Sciences is the use of *ideal type* as introduced by sociologist Max Weber (1864-1920). Ideal type is also commonly known as model, paradigm and theory, where *model* is the most frequently preferred term (Ritter, 1986: 201-202).

Ritter (1986: 201) defines ideal type as *"synonyms denoting simplified, schematic characterizations of social phenomena (institutions, movements, processes, human groups and so on) that serve as aids to reflection and research".*

The description of the given social phenomenon is not meant to reflect *all* aspects of that given phenomenon, but rather emphasize certain central elements that are similar in most cases of the given phenomenon (Daudin & Pierre, 2009: 1-2). However these central elements are not identified through the calculation of average values (Marshall, 1998), i.e. both interpreted from a quantitative- and qualitative perspective. The use of the word *ideal* does not refer to the perception of something being excellent (Encyclopedia Britannica), but rather the word *idea.* The idea is thus something being developed with reference to real world phenomena (Marshall, 1998).

Although an ideal type might be a construction of a researcher's imagination, it must be rooted in something that is perceived to be real. Thus, one could argue that ideal type eventually is rational product (Ritter, 1986: 203), but may as well contain normative aspects (Harrington, 2005: 65).

It is important in this connection to stress that despite a model being a rational product does not mean it is *de facto* representing the concrete reality (Coser, 1977: 223-224). A model must thus not be treated as the truth, but rather as a helpful intellectual tool to stimulate and inspire (Richardson, Mathieson & Cilliers, 2000: 34).

The proposed meta-competency model for leadership in complex military systems is thus a provisional tool in which our understanding of the meta-competencies, leadership and complex military settings, is constantly re-negotiated as a result of each individuals' interaction with its environment (Osberg et al, 2008: 219).

The main sources of error connected to this form of research design are linked to formulations that cannot be verified empirically and a set of assumptions which cannot be classified as realistic or relevant (Mouton, 2001: 177).

The proposed research question and research objectives imply a strong link between the abstract and theoretical, and concrete and empirical. The assumptions of the proposed model are based on the principles of a Complexity Approach which will be discussed and identified through chapter 3, 4 and 5 of this dissertation. These principles are widely recognized within the research-field of the Complexity Sciences and it can thus be argued that the assumptions are both realistic and relevant.

The meta-competency model will seek to describe an *ideal type* of desired meta-competencies for effectuation of leadership in complex military systems. In discussing the model's relevance it is perhaps initially expedient to verify its content in relation to the literature. However, as military organizations implement Complexity Principles into the organization, the model has more ground to be evaluated empirically.

This dissertation will from this point on use the term "model".

Now that the issue of research designs has been clarified, it is left to us now to describe and discuss the process of data collection for the empirical research.

2.3 Data Collection

Interviewing is the data collection method that will be used for the empirical survey. This involves a structured, self administered and paper-based questionnaire with closed-ended questions (Mouton, 2001: 105; Babbie, 2004: 245).

According to Mitchell and Jolley (1998: 288) a self-administered questionnaires have the advantages of being relatively inexpensive, easy to distribute and ensure sufficient anonymity. On the other side, however, a self-administered survey often provides a low respond rate, it does not allow interaction between the researcher and the subjects of study and does not give any feedback as to whether or not the participants have interpreted the survey questions correctly or not.

Using a paper-based questionnaire offers the following advantages and disadvantages.

Advantages:

- The data collection is not dependent on technological equipment.
- The participants do not need to have any data knowledge- or skills.
- The process of data collection is less sensitive to external disturbance such as loss of electrical power.

Disadvantages:

- Compared to web-based data collection the paper-based date collection method is more expensive (Ardalan, Ardalan, Coppage & Crouch: 2007)
- A paper-based questionnaire will result in a decrease in speed for the data collection process (Helaey, Macpherson & Kuijten: 2005)

In order to ensure a high response rate on the questionnaire it has proved essential to conduct the data collection when the subjects of study were gathered at the Joint Staff College. In this case, the Joint Staff College planned a time slot into the educational program to ensure that as many Officers as possible could answer the questionnaire. A web-based data collection technique would in this case most likely decrease the response rate.

A study by Beuckelaer and Lievens (2005) concluded that strong measurement equivalence exists between web-based and paper-based surveys. Hence, the quality of the data gathered through a paper-based questionnaire should not differ radically from a web-based questionnaire.

For the development of the questionnaire and the actions taken to counteract error in questionnaires, as for instance no pre-test of questionnaire, leading questions, poor and confusing layout and sensitive or threatening questions (Mouton, 2001: 103-104), please see Rønn (2009).

The process of data collection and the content of an empirical survey lead this dissertation to the measuring instrument, which will be discussed in the next section.

2.4 Measuring Instrument

The measuring instrument which will be used in this dissertation is a questionnaire developed by Rønn (2009).

The questionnaire is divided into three parts and consists of 60 questions (appendix 1).

The first part in the questionnaire is the introduction which has the intention to enable the respondents to correctly answer the questionnaire and simultaneously inform them of their rights. The second part seeks to capture the relevant demographic details and the third part forms the main part of the questionnaire where the Officers' attitudes towards general Complexity Principles and a Complexity Approach to leadership will be measured.

For further information regarding the development of the measuring instrument this dissertation requests the reader to consult the dissertation of Rønn (2009).

Based on the experiences from Rønn (2009) the following changes have been made to the questionnaire in order to increase the quality and validity of the collected data.

2.4.1 Demographic Details

The control variables used in Rønn (2009) were based on the fact that the data was gathered from the Norwegian Military Academy. This dissertation therefore finds it necessary to adjust the control variables to the subject of study in the proposed dissertation.

The participants' current education, gender, age and career background are anticipated to influence the responses given in the questionnaire and are therefore included as control variables. The demographic details are presented in the following way:

- Current education (1= Masterstudie, 2= Stabsstudie).
- Gender (1= male and 2= female)
- Age in years
- Career background (1= The Army, 2 = The Navy, 3 = The Air force, 4= Home guard, 5= Civilian, 6= Other)

This research proposal also finds it necessary to change specific questions, something which now will be elaborated.

2.4.2 Changes to Specific Questions

The rationale behind changing some of the questions is based on either;

1) Feedback from the participants in the survey conducted by Rønn (2009) regarding problems with the interpretation of specific questions.

2) A high “uncertain” response percentage which might be an indication that the participants have not clearly understood the question, or
3) A general re-evaluation of sentence structure and the use of specific words.

The questionnaire is based on a set of factors identified as relevant in complexity literature and a Complexity Approach to leadership, and each factor has two questions (Rønn, 2009). The presentation of the changes is therefore structured around the different factors in order to create traceability to the original questionnaire. Both questions on each factor are presented, although in most cases only one question is corrected. The presentation of both questions is done to give the reader a better understanding of the changes.

Changes are marked with red in table 1.

Reference	***Q***	***Statement***
Factor 17: Disrupt existing patterns	32	I think it can be useful to sometimes create uncertainty and instability in an organization. I think a leader should *often* create uncertainty and instability in the organization.
Factor 17: Disrupt existing patterns	46	When I am leading a task I *usually* try to minimize uncertainty and instability in my organization and create harmony
Factor 10: Causality and linearity	10	Small actions *usually* create small effects. In other words, if I do little I create little.
Factor 10: Causality and linearity	25	A decision or action made by a sergeant on team level can create big effects at the strategic level Great effort *usually* creates great effects.
	8	Chaos in an organization is *usually* looked upon as something

Factor 8: Chaos		negative and destructive I *usually* look at chaos in my organization as something negative and destructive
Factor 8: Chaos	23	Stability and balance in an organization is usually looked upon as something positive and constructive I *usually* look at stability and balance in my organization as something positive and constructive
Factor 7: Holism	7	When I am analyzing a problem the best thing is to split the problem into smaller problems and solve each one of them independently. In other words, the whole = part+part+part etc.
Factor 7: Holism	22	When I am making a decision I *always* think how the decision might affect the “bigger picture”. I believe that splitting a problem into smaller problems and then analyzing them separately will create inaccurate results. In other words, the whole is greater than the sum of its parts.
Factor 6: Process-orientation	6	I believe that managing by objectives or goals *usually* is the best way to create success for my organization.
Factor 6: Process-orientation	21	I believe that the life in my organization in essence is a process of human relations and that a process-orientation *usually* achieve more than a goal-orientation

		I believe that a fundamental focus on processes instead of goals *usually* will be the best way to create success for my organization
Factor 20: Decentralization	35	I believe that a decentralization of control and responsibility *often* create poorer results
Factor 20: Decentralization	49	I do *not* think that in order to create control and effectiveness, planning and decision-making should optimally be placed centrally of the organizational hierarchy. A believe that a centralization of control and responsibility *often* create better results
Factor 21: Leadership as system-centred	36	I see myself as a leader who works as an *objective* observer of events and who intervenes with corrective directions and regulations when the events deviate from the plan. As a leader I observe events and intervene with corrective directions when the events deviate from the plan.
Factor 21: Leadership as system-centred	50	I think that leadership is an expression of the collective behaviour of my organization where I, as a formally appointed leader am a *participant*.
Factor 5: Qualitative methodology	5	To create an understanding of something I often only need to be given the statistics, objective figures and concrete facts.
Factor 5: Qualitative methodology	20	My experience is that statistics, facts and figures alone do not give the necessary input to fully understand something. My experience is that statistics, facts and figures alone *rarely* give the necessary input to create an understanding of something.
Factor 13: Open systems	13	I believe that my organization is very much affected by external events and that it needs to constantly *adapt* to changing circumstances

Factor 13: Open systems	28	I believe my organization should always stick to the defined plans and strategies. I believe my organization *in most cases* should stick to the defined plans and strategies.
Factor 19: Informal leaders	34	As a military leader I get my power through the formal structure of the organization. Military leaders get their power through the formal structure of the organization
Factor 19: Informal leaders	48	As a military leader I get my power as a result of being recognized as a leader by the other group members through the everyday interaction. Military leaders get their power as a result of being recognised as a leader by the organization's members through the everyday interaction.
Factor 22: Building and mending relationships	37	In order to handle complex problems military leaders *should* have their main focus on the micro-level interactions between people.
Factor 22: Building and mending relationships	51	A complex problem *usually* requires complex- and often technical solutions In order to handle complex problems military leaders *should* emphasize the use of complicated technical solutions.
Factor 15: Rationality	15	When I make a decision I *usually* try to base it on a thorough analysis taking all relevant facts into account. When I make a decision I *usually* base it on a thorough analysis taking all relevant facts into account.
Factor 15: Rationality	30	I *usually* make spontaneous decisions based on intuition.

Table 1 - Changes to questionnaire

It is anticipated that the changes on these questions will increase the quality and validity of the collected data without inflicting negatively on the intention of the data collection, i.e. to measure the Officers' attitudes towards Complexity Principles and a Complexity Approach to leadership.

This dissertation will now continue to describe the removal of certain questions from the questionnaire.

2.4.3 Removal of Questions

The results from the survey conducted by Rønn (2009) found that question 59 and 60 in the questionnaire were irrelevant, and will therefore be removed.

Now that the conceptualization, research designs, data collection and measuring instrument have been discussed the next step is a description of the process of sampling.

2.5 Sampling

The sampling technique adopted during the research conducted in the proposed dissertation will be a method of non-probability convenience sampling. Generally speaking, the larger sample size the study has, the smaller is the error and a more accurate basis for calculating results.

The convenience sampling method is characterized by selecting the individuals that are the easiest to obtain in order to attain the research question. The method is also dependent on the availability and the willingness of the participants to take part in the survey (Welman et al, 2005: 69-70; Mitchell & Jolley, 1998: 304).

A non-probability sampling method is a relatively simple and cheap method. However, this technique is often not representative in terms of the general population (Welman et al, 2005: 70). The researcher can exercise little influence on the representativeness of the sample and the probability of a biased sample is therefore relatively big (Gravetter & Forzano, 2003: 125-125; Mitchell & Jolley, 1998: 498).

The proposed dissertation does, however, not intent to do research which will be valid for the general population, but rather for a selected group of the society, the military Officers. The issue of representativeness has thus less relevance.

The data for the empirical survey will be collected from the Norwegian Joint Staff College which is organized in two different classes, stabsstudie and masterstudie.

Subject of Study

The Officers at the Norwegian Joint Staff College form the study unit for the purposes of the empirical research conducted in this dissertation.

A brief background of the Norwegian Armed Forces, the Joint Staff College and the Officers will now be presented.

Historic Background

The modern history of the Norwegian Military Service is founded in the Norwegian constitution, passed by the national assembly at Eidsvoll on the 17th of May 1814 (www.nb.no).

Based on paragraph 109 in the Norwegian constitution, which states that *"Every citizen of the State is in a certain period obligated to defend its country, without taking background or wealth into consideration"* [1] (www.lovdata.no), a general conscription has been the foundation for the Norwegian Armed forces.

After the Second World War, in 1949, Norway joined the North Atlantic Treaty Organization (NATO) something which has been a major contributor to Norwegian Security- and Defense policies. Due to its geographical location, Norway played an essential role during the Cold War, something that has been reflected in the importance of alliances in modern Norwegian Defense history.

The fall of the Soviet Union and subsequently the end of the Cold War resulted in major changes in the Norwegian Armed Forces. The transformation of the Armed Forces has amongst others been materialized in the form of a highly reduced number of soldiers, a modernization of the equipment and a shift in focus from territorial defense to international operations.

[1] Translated by the author of the thesis

The Hierarchical Organization

Parliament is represented by the Norwegian National Assembly and has the task of legislation, allocation of financial assets, control of the executive branch (the Government) and general political questions like reforms and foreign policy (www.stortinget.no (1)). The Norwegian Parliament consists of different specialist committees such as the Parliament's committee for Defense that considers matters related to defense policies (www.stortinget.no (2)).

Government is represented by the executive branch and is lead by the prime minister and the cabinet ministers, including the Minister of Defense (www.regjeringen.no). Government is responsible for the execution of laws and guidelines passed by Parliament (www.regjeringen.no).

The Norwegian Ministry of Defense, which was established in 1814, has the responsibility in Government to shape and effectuate the guidelines given by Parliament. The Ministry is lead by the Minister of Defense, who is the political representative in the matter of defense policies (www.regjeringen.no). The Defense Chief, who is the highest ranked military leader of Norwegian Defense Force, also functions as the highest military adviser in the Ministry (www.forsvaret.no).

The Norwegian Armed Forces

The Norwegian Armed Forces is lead by the Headquarters Defense Command Norway, which again is subordinate to the Ministry of Defense (www.mil.no (1)).

The Defense Chief executes policies given by the Norwegian Ministry of Defense and has the overall military responsibility to protect the nation from external military threats.

The main operational pillars of the Norwegian Armed Forces are the Army, Royal Air Force, Royal Navy and the Home guard with approximately 23 000 personnel. In cases of mobilization the strength is according to mobilization plans approximately 83 000 combatant personnel (www.mil.no).

The Joint Staff College

The Joint Staff College offers the highest national military Officers' education in the Norwegian Armed Forces. The institutions primary areas of responsibility are competence training and education in the Norwegian Armed Forces, where the execution of the staff- and master study is one of the most essential tasks (Studiehåndbok, 2009: 8).

The Officers

The staff- and master study at the Joint Staff College is offered to a selection of Officers and civilians from all branches of the Norwegian Armed Forces, who after successfully finishing the education, will occupy central positions within the Armed Forces, nationally and internationally (Studiehåndboken, 2009: 9).

As illustrated in figure 5, the educational hierarchy in the Norwegian Armed Forces consists of four main steps. The students attending the Joint Staff College has a minimum educational level of bachelors degree (or equivalents) and additional relevant professional experience.

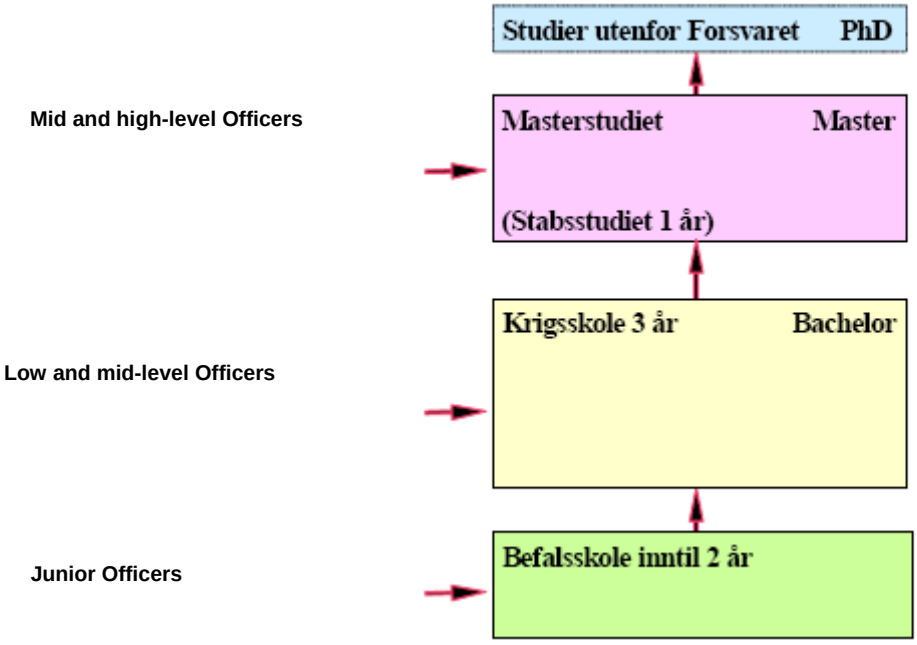


Figure 5 - Educational hierarchy (adapted from Studiehåndboken, 2009: 8)

A further description of the sample will be presented in chapter 6 under Sample Description. The next section of this chapter looks at the administering of the collected data.

2.6 Administering

Mitchell and Jolley (1998: 499-500) emphasize that the administering of the data must be conducted in a professional way. Participants should get information regarding the nature of the study and be given clear instructions.

The process of administering is divided into two parts. The first involves gaining access to the subjects of study and the second involves administering in connection with the data collection.

2.6.1 Gaining Access to the Subjects of Study

A formal contact between the researcher and the Joint Staff College was initiated by the researcher in June 2009. The researcher sent an application to conduct a survey (appendix 2) with an additional letter of enquiry to conduct research from the Stellenbosch University (appendix 3).

The survey was conducted on two separate dates. The data was collected from *stabsstudiet* on October the 14th and from *masterstudiet* on October the 16th.

There has been no direct contact between the researcher and the subjects of study (the Officers).

2.6.2 Administering in Connection With Data Collection

A week before the data-collection the researcher send the questionnaire electronically (appendix 1) together with general information and guidelines (appendix 4) to the contact person at the Joint Staff College.

In order to quality assure the process of practical data collection the researcher called the contact person on the Joint Staff College two days before the collection and talked through the process as described in appendix 4.

After collecting the data the questionnaires was send to South Africa using a mail dispatch (please also see appendix 4).

The results from the survey will be made public for the Joint Staff College as soon as possible.

Now that the process of administering the questionnaire to the Officers has been discussed the next step is a description of data-capturing, data-editing and missing values.

2.7 Data-capturing, Data-editing and Missing Values

The questionnaire is based on numeric data, which according to Mouton (2001: 108) often is easy to capture and is well structured. However, there are a number of common errors in data capturing. These are referred to as *"capturing errors, post-coding errors and too many missing values"* (Mouton, 2001: 109).

In order to minimize the occurrence of capturing errors the researcher has taken the following precautionary steps:

- The researcher uses SPSS (Statistical Package for the Social Sciences) in the data capturing process and will together with a second controller capture the data.
- Post-coding errors are not relevant for this questionnaire due to the use of close-ended questions.
- Each questionnaire is numbered in order to create traceability of the captured data.

Tabaknick and Fidell (2001: 58-59) argue that missing data is often a considerable source of error in data analyses. The patterns of missing values are more important than the number of missing values. What this means is that if the missing data is scattered randomly in the questionnaire it may not cause a dramatic impact, but if the majority of the participants do not reply to demographic details for example, the consequences might be severe for the validity of the research.

It is reasonable to conclude that this study is not much affected by missing values. The only case of missing values in this survey was two respondents not capturing their age.

These missing values were marked as "no response" and are, where necessary, reflected in the results presented in chapter 6.

The process of data-capturing and data-editing has highlighted some important prerequisites for creating a valid and representative basis for analysis. This dissertation will now move on to a presentation and discussion concerning the analysis of the captured data.

2.8 Analysis

The analysis of the data for the purposes of this research dissertation will be based on a quantitative methodology using descriptive statistics to present the results obtained from the data collection. Gravetter and Forzano (2003: 357) define descriptive statistics as *"methods that help researchers to organize, summarize, and simplify the results obtained from the research studies".*

In order to organize and simplify the results this dissertation will use frequency distribution tables and frequency distribution graphs where necessary. A frequency table consists of two columns, where column one presents the scale of measurement and the second column presents the number of responses (Gravetter & Forzano, 2003: 359).

According to Mouton (2001: 109-110) some of the most common errors associated with poor analysis and interpretations are *"using inappropriate techniques in quantitative analysis, drawing inferences from data that are not supported by the data and biased interpretation of the data through selectivity".*

This dissertation will use SPSS as a means to interpret the data. In order to minimize the most common errors as described above, the researcher will get technical support from the School of Public Management, Stellenbosch University.

The presentation of the results will be organized as illustrated in figure 6.

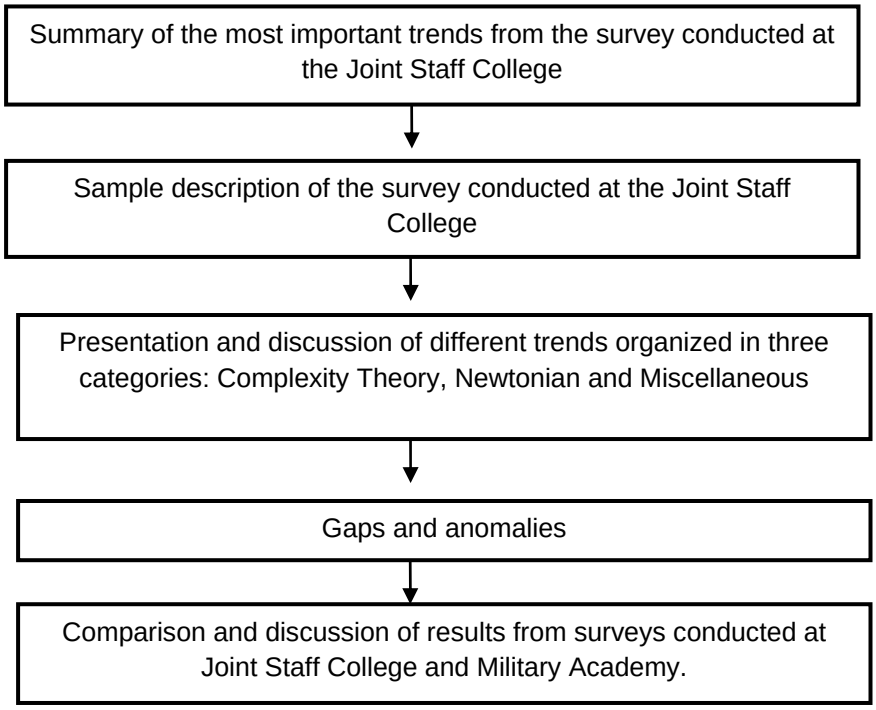


Figure 6 - Presentation of analysis

The analysis will intially shortly present the most important trends from the survey conducted at the Joint Staff College and describe the method of calculation.

Secondly, the sample description of the survey conducted at the Joint Staff College will be presented.

Thirdly, the different trends from the survey conducted at the Joint Staff College will be highlighted organizing the results into particular Complexity Trends, Newtonian Trends and miscellaneous.

Fourthly, possible gaps and anomalies will be underlined that might shed light on the validity of some trends.

Fifth and finally, based on the results from the surveys at the Military Academy and the Joint Staff College this dissertation will discuss some possible general conclusions of Norwegian military Officers' attitudes towards Complexity Principles. Links to relevant key literature presented in this dissertation will simultaneously be provided.

Some possible shortcomings and sources of error might affect the validity of the results. This is something which forms the focus of the discussion of the following section.

2.9 Shortcomings and Sources of Error

Some possible shortcomings and sources of error have been highlighted throughout this chapter while simultaneous actions to counter-act the possible deficiencies have consequently been proposed. However, there are some possible shortcomings and sources of error that have not yet been presented.

2.9.1 Method Variance

It is reasonable to argue that in some cases the inferences made from the Officers' responses can be overrated due to the fact that they are obtained from a single source (Guthrie, Coate & Schwoerer, 1998: 384). In other words, making use of multiple sources of data can reduce the effect of the common method variance (Dannhauser, 2007: 369-370). For instance, individual- or group interviews with the Officers' supervisors might serve as an additional source of data or perhaps an expansion of the survey to include other institutions.

2.9.2 Data Collection in a Single Moment in Time

Another possible source of error could be that the empirical survey was collected in a single moment in time[2]. By integrating a longitudinal approach to the data collection process the measurements would most likely be more accurate by (for instance) reducing the shortcomings of using one source (Dannhauser, 2007: 371-372) and simultaneously show that the responses are consistent over time. In light of this a longitudinal approach would be favorable in a possible continuation of the research presented in this dissertation, but for the sake of the present data collection it is limited due to practical reasons such as time.

2.9.3 Single Sample

This dissertation has a reasonably homogenous sample, which again implies that the results are only relevant for that specific sample. The integration of results from survey conducted by Rønn (2009) might increase the validity of the results to some extent, but still within the framework of the Norwegian Armed Forces. Hence, in order to generalize the findings of the empirical research in this dissertation to other settings, a replication of the questionnaire is recommended.

2.9.4 Problems Understanding Specific Questions

Question 59 in the questionnaire asked whether the respondents had experienced any problems understanding any of the questions or not. 9.8% of the respondents reported problems understanding isolated questions, but no particular trend can be established identifying questions many respondents had problems with understanding. Thus, this dissertation concludes that the problems reported are of little significance to the validity of the results.

[2]The data was collected on two different dates but in a very close time-frame. It is thus interpreted as a "single moment in time" and not as a longitudinal approach.

2.10 Summary

The aim of this chapter was to outline the research design and methodology used in order to answer the research question. This chapter is essential in order to obtain research objective 4 and 5, which are formulated as follows:

Research objective 4: *To describe and analyse Norwegian Officers' worldview against the principles of a Complexity Approach and leadership in complex systems*

Research objective 5: *To develop a meta-competency-model for leadership in complex military systems.*

The main findings of this chapter are linked to the different sub-objectives. These sub-objectives and the findings are listed below.

Research objective 1.1: To describe conceptualization.

The non-empirical literature-review creates the foundation for the development of the empirical survey. The results from this survey and the findings of the literature review serve as the theoretical foundation for the development of the competency-model.

Research objective 1.2: To describe research designs.

This dissertation uses three different research designs, non-empirical literature review based on secondary data, empirical survey based on primary data and model-building study.

Research objective 1.3: To describe and discuss the measuring instrument

The measuring instrument used in the empirical survey consists of 60 questions and is developed by Rønn (2009).

Research objective 1.4: To describe and discuss the sampling design, sampling methods and subject of study.

The sampling method in this dissertation is based on a method of non-probability convenience sampling.

The subject of study is the Norwegian military Officers attending the Joint Staff College.

Research objective 1.5: To describe and discuss the process of data collection.

The data collection is a paper based and self-administered questionnaire.

Research objective 1.6: To describe the process of administering.

The researcher gained access to the subject of study through a formal application addressed to the Dean at the Joint Staff College.

The practical data collection was done at the Joint Staff College by the Joint Staff College based on instructions from the researcher.

Research objective 1.7: To describe and discuss the process of data-capturing and data-editing.

The questionnaire is based on numeric data and will be captured using SPSS (Statistical Package for the Social Sciences).

Research objective 1.8: To describe and discuss the process of data analysis.

The analysis of the data in this dissertation is based on a quantitative methodology using descriptive statistics. The presentation of the results will be presented as Complexity Trends, Newtonian Trends and Miscellaneous.

Research objective 1.9: To describe and discuss possible shortcomings and sources of error.

This dissertation has identified that method variance, data collection in a single point of time and single sample might be considered as possible shortcomings and sources of error.

The elucidation of the research design and methodology brings us to the non-empirical literature study, which will be initiated by a description and discussion of complexity.

Chapter 3 – Complexity, a Conceptual and Theoretical Analysis

The work presented in this chapter is partially based on the research done by Rønn (2009) presented in the Master's dissertation "An investigation into the worldview of a selected group of Norwegian Army Cadets from a complexity and leadership perspective" completed at the University of Stellenbosch, South Africa.

Complexity, which obviously is a complex field of study, requires an interdisciplinary and pluralistic approximation on- and between different research traditions, from Natural Science to Social Science, from quantitative methodology to qualitative methodology, and non-empirical to empirical studies.

This chapter will initiate the examination of complexity by articulating research objective 1:

Research objective 1: Based on a non-empirical literature review, to define and describe a Complexity Approach and differentiate it from what is understood by an orthodox Newtonian Theory.

In order to achieve research objective 1 this chapter is divided into multiple sub-objectives:

Research objective 2.1: To describe the Newtonian Approach and its general implications.

Research objective 2.2: To describe and discuss different perceptions of complexity

Research objective 2.3: To describe and discuss what the characteristics of a complex system are.

Research objective 2.4: To describe and discuss different conditions for complexity

Research objective 2.5: To present proposals for general implications of complexity

Research objective 2.6: To summarize the most important points of the chapter.

This chapter is organized into four different parts. The first part argues that reductionism, determinism and closed system thinking is the cornerstone of a Newtonian Approach and describes some of the implications. The second part describes different perceptions of complexity by discussing the evolution of complexity and complexity sciences, different schools of complexity, the difference between what is simple, complicated and complex and characteristics of complex systems. The third part describes and discusses how emergence, non-linearity, disequilibrium, feedback and self-organizations are necessary conditions for complexity. The fourth and final part presents proposals of general implications of complexity for the further research of this dissertation.

3.1 Part One: Paradigm of Order

The purpose of the initial phase of this chapter is to create a foundation for the later description of complexity by discussing what many will refer to as the current paradigm or the paradigm of order.

This dissertation aims to describe and discuss the concepts of reductionism, determinism and closed systems thinking in order to highlight the main principles of the paradigm of order.

Throughout this dissertation, the paradigm of order will be represented by the label *Newtonian*, a conception closely related to the work of Sir Isaac Newton and Cartesian Reductionism (Fernandez et al, 2007: 171). Some might also refer to this as *modernism* whose ideal is to describe non-contingent, universal and non-historical principles which allows precise description and thus knowledge of phenomena (Cilliers, 2010: 3).

3.1.1 Reductionism

Reductionism dates back to the scientific revolution of the 17th century and is deeply rooted in Western intellectual thinking (Strand, 2007: 198).

In order to understand a system, whether it is a simple or complex phenomenon, you need to reduce it to its individual components and analyze its properties (Heylighen & Cilliers, 2006: 2). By understanding the basic properties and their initial condition, you will be able to understand the functioning of the system as a whole. For instance, if you have the complete knowledge of atoms, you will, by following this logic, understand organisms and eventually societies as everything is constituted by atoms (Mitchell, 2004: 82-83).

A significant feature of reductionism is thus an *atomistic* focus on how isolated parts build the system as a whole through a simplistic puzzle (Cilliers, 1998: 456). By implication, this would mean that the relationship and the dynamics between the isolated properties are typically non-problematic and that effects may be traced back into time through a *causal* chain of events (Dekker, unpublished: 5).

A reductionist perception is also *materialistic* in the sense that all phenomena are believed to be constituted by matter, whether the phenomena are physical, mental, social or biological (Heylighen & Cilliers, 2006: 2).

3.1.2 Determinism

A Newtonian system is inherently *deterministic* (Kiel, 1994: 12; Fernandez et al, 2007: 173).

Determinism, or the reference to something being deterministic, relates to the belief that an outcome can be predicted because all the variables causing the outcome is either similar to a previous event or are all known (Microsoft Encarta, 2008 (1)).

A prerequisite of determinism is a *linear* and *causal* perception of development (Parker & Stacey, 1997: 12-13). In a linear system input equals output proportionally, so if you put a lot of energy in to something, a similar level of energy will come out, and the output is directly linked to the components and their properties through a causal chain of events.

A natural feature of determinism is that one is believed to be able to predict events and consequently control development (Wheatley, 1999: 28). Hence, determinism assumes that all variables must be present and the specific state of the variable must be accurate and well known. In other words, to predict the future we need to have advanced knowledge of the future. The certainty of pre-existing order further implies that there is only the possibility of one true story of what happened (Dekker, unpublished: 5).

The characteristics of a deterministic framework presented in these last paragraphs speaks for an emphasis on *quantitative methodology* (Darwin, 2001: 483), as for instance well tangible and mechanistic oriented statistical approaches and policy models such as that proposed by Dunn (1994) and Wissink (1991) (De Coning & Cloete, 2005: 71-73). A quantitative approach will evidently try to reduce a complex phenomenon to a simple one (Cilliers, 1998: 24).

3.1.3 Closed System

Ulanowicz (2007) refers to a Newtonian system as causally closed.

The boundaries of a system are thought be static and not subject to external influence, i.e. individuals and organizations exist independent of their environment (Juarerro, 2007: 110).

Objective measurements through mathematical and logical language are the basis for the perception of reality (Strand, 2007: 198) and a studied phenomenon exists in isolation of the observer (Fernandez et al, 2007: 173). The world is best understood as isolated, unchallengeable and a static object that operates in a deterministic framework (Juarerro, 2007: 110).

3.1.4 Implications

Sturmberg and Cilliers (2009: 3) argue that the principle of distinction conservation is a summary of the assumptions of Newtonian conceptions. The different components, properties and states of a system under observation require a precise distinction which is thought to be absolute and the same for all observers.

Hence, man is acting rational and makes decisions on rational bases. Logical and cost-effective actions are taken on the background of the identification of a desired state and perfect information about the consequences of choice (Bondorowicz, 2010).

A Newtonian world of reductionism, determinism and closed system thinking does not require any novelty or creation as everything that exists has always, and will always exist, although in slightly different configurations (Sturmberg & Cilliers, 2009: 3). Although novelty is not required, increased knowledge of the basic components and their properties is necessary to maintain control, order and equilibrium. Increased knowledge of a phenomenon will over time shift the system from a disorderly state to an orderly condition. Hence, knowledge equals greater ability to predict and control, and there is simultaneously a belief that there is an endpoint to phenomena and consequently knowledge (Geyer, 2003: 3-4) (figure 7).

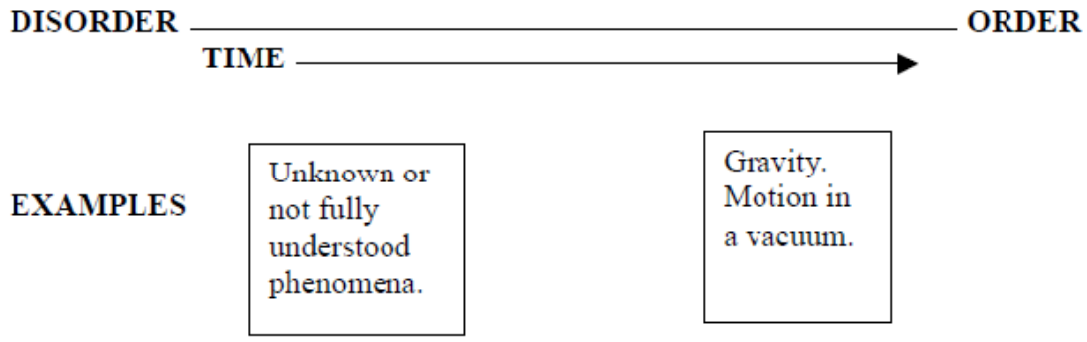


Figure 7 - Paradigm of order

The simplicity of reductionism and predictability of determinism are of course compelling, convenient and popular concepts as they produce rule based models that simplify the complexity of the world into something we can understand and manage. A symmetrical and homogenous world would allow an accurate modelling and thus fundamental understanding of that world (Cilliers, 2010: 3). The lack of dynamism and openness creates, however, a sphere of, to use the words of Ulanowicz (2008), “suffocating confinement” in a world which is far away from being characterized as being rational, linear and logic.

Let us proceed to an exploration of the world of radical uncertainty, the domain of complexity.

3.2 Part Two: Perceptions of Complexity

Complexity as an interdisciplinary and pluralistic phenomenon may be approached in an unlimited number of ways. This part of the chapter will present some perceptions of complexity by discussing the relevance of different definitions of complexity followed by a description of the evolution from simplicity to complexity and how Complexity Sciences bridges modernism and post-modernism. Different schools of complexity are then presented before we discuss the difference between what is simple, complicated and complex. Part two of this chapter ends with a comprehensive description and discussion of characteristics of complex systems.

3.2.1 Defining Complexity

This section of the discussion now looks to a number of dictionary definitions for complexity. According to the New English Oxford Dictionary complexity can be defined as "*not easy to analyze or understand*", while the Cambridge International Dictionary of English defines it as "*involving a lot of different but related parts*" (Nilsson, 2007: 237).

Perhaps the most well known definition of complexity is offered by Waldrop (1992) who illustrates the boundaries of complexity by referring to it as "*the domain between linearly determined order and indeterminate chaos".*

Zimmermann, Lindberg and Plsek (1998: 256) focus on the characteristics of complex phenomena by describing it as "*systems characterized by nonlinear interactive components, emergent phenomena, continuous and discontinuous change, and unpredictable outcomes".*

Blackman (2001: 440) and Cilliers (1998: 456) offer yet another angle by stating that complexity and complex systems must be understood in terms of relationship and networks, not by their isolated elements and their properties.

These definitions illustrates the wide and fundamental scope of complexity which makes it difficult, and to some extent impossible, to precisely present a general and uniform definition of what complexity is. Fernandez et al (2007: 175) point to the fact that every definition focuses on different parts of complexity and does not offer a holistic useful explanation. Capra et al (2007:17) further state that imposing strong limitations on what complexity is or

what the different components should mean, oppress the great potential of complexity. However, this does not mean that we do not have knowledge about complexity and complex systems, but that the knowledge must be interpreted as provisional (Cilliers, 2005: 260; Osberg et al, 2008: 219).

Complexity is a continuously- and fast growing field of research that is "labelled" in a number of different ways.

Complexity Theory is one of these labels which represent Natural Science and Social Science methodologies by enabling a bridge between the naturalism of modernism and anti-naturalism of post-modernism (Geyer, 2003: 15).

Chaos Theory, by some characterized as a building block to Complexity Theory (Schneider & Somers, 2006: 355) and by others labelled as a distinct version of Complexity Theory (Cloete, 2006: 467), can be defined as the study of *"complex, dynamic, deterministic, non-linear systems that reveal patterns of order out of seemingly chaotic behaviour"* (Cloete, 2006: 469).

Complex Adaptive Systems (CAS) are interpreted by some researchers as the basic unit of analysis in the science of complexity (Uhl-Bien, Russ & McKelvey, 2007: 299) or as an expression of complex systems defined as:

"A system of individual agents, who have the freedom to act in ways that are not always totally predictable, and whose actions are interconnected such that one agent's actions change the context for other agents" (Praught, 2002: 518).

Complex Responsive Processes (CRP) is yet another label related to complexity which is characterized primarily by a fundamental focus on communicative processes of human relating and simultaneous social construction of individual and group identities (Aasen & Johannessen, 2009: 24).

The presented labels, but also other tags such as non-linear systems, quantum mechanics, Advanced Systems Theory or bounded stability (Uys, 2002: 35), are in many respects a semantic exercise which represents different aspects of complexity but simultaneously refer to the same basic principles.

Before continuing the discussion of different perceptions of complexity this dissertation will briefly look at some of the historical development within the field of complexity.

3.2.2 From Simplicity to Complexity

The Science of Complexity is an emerging field of study which captures the interest of scientists on a wide field of research, for instance Biology, Mathematics, Anthropology, Economics, Sociology and Management. For instance the empirical application of complexity thinking may be attributed to climate change models, neo-reductionist methods of Mathematics, agent based modelling of social systems and even the interpretation of jazz music (Borgo & Goguen, 2005).

The common denominators of these different fields of research and empirical applications appears to be the fundamental search for knowledge about change, adaptability and living systems (Praught, 2002: 515).

Although one might suspect that complexity and complexity thinking is a fairly new concept, it may in fact be traced backed to the work of the Greek philosopher Heraclitus (540 – 480 BC) (Microsoft Encarta (2)), which paradoxically is a much older methodology than modernism and Newtonian metaphors.

Heraclitus was process-oriented and described the world as a place in constant flux with mutually interacting and co-evolutionary organisms. As opposed to the rigid methodology substantiating the paradigm of order, Heraclitus argued for the conceptual threads of non-linearity, deterministic chaos, complexity, self-organization and emergence (Ilachinski, 1996: 48).

Linking the conceptual threads to the underlying principles between a Newtonian and Heraclitian approximation respectively, the differences may be summarized in table 2 as follows.

Context	"Newtonian" Metaphor	"Heraclitian" Metaphor
Complex behavior	Complex behavior requires complex models	Simple models often suffice to describe complex systems; *complexity from simplicity* and *simplicity from complexity*
Patterns of behavior	Each qualitatively different pattern of behavior requires a different equation	Qualitatively different patterns of behavior can be described by the same underlying equation
Description of Behavior	Each qualitatively different kind of behavior requires new equation or set of equations	One equation harbors a multitude of qualitatively different patterns of behavior
Effects of small perturbations	Small perturbations induce small changes	Small perturbations can have large consequences
How to understand system	A system can be understood by breaking it down into and analyzing its simpler components	Systems can be understood only by respecting the mutual interactions among its components; look at the *whole system*
Origin of Disorder	Disorder stems mainly from unpredictable forces *outside* of system	Disorder can arise from forces entirely *within* the system
Origin of Order	Order must be imposed from *outside* the system	Order can arise in a purely self-organized fashion *within* the system
Nature of observed order	Order, once present, is pervasive and appears both locally and globally	A system may appear locally disordered but possess global order
"Goal"	Goal is to develop "equations" to describe behavior; determined by isolating effect of one variable at a time	Goal is to understand how entire system responds to various contexts, with no one variable dominating
Type of "solutions"	Goal is to search for "optimal" solution	No optimal solution exists, as the set of problems and constraints continuously changes
Predictability	Assuming that the "correct" model is found and initial conditions are known exactly, everything is predictable and controllable,	Long-term predictability may be unattainable even in principle; behavior may be predicted for short-times only
Nature of causal flow	Causation flows from the *bottom up*	Causation flows both from *bottom up and from the top down*

Table 2 - Underlying principles of Newtonian and Heraclitian metaphors (Ilachinski, 1996: 53)

Heraclitus's conceptual threads and underlying principles are recognizable in the work of other pioneers in the field of complexity. The significant scientist Albert Einstein claimed that a Newtonian perception of life was either misleading or defective as a descriptive framework, and concluded that "*possible unidentified, multiple, complex, non-linear, organistic cause-effect relationships"* might be more important driving forces behind natural phenomena (Cloete, 2006: 464).

The Nobel Prize winner and German physicist Werner Heisenberg (1901-1976) and his work on Quantum mechanics represent an essential contribution to the field of complexity. The Heisenberg Uncertainty Principle, which means that the velocity and exact position of a particle cannot be known simultaneously (Microsoft Encarta (3)), reveals, to use the words of Ilya Prigogine, the "radical uncertainty" linked to living phenomena. Any act of observation influences, and is connected with, the situation being observed (Cloete, 2006: 248), thus illustrating the difficulties of defining the boundaries between objective and subjective perceptions, and the interconnection between the observer and the environment.

The French mathematician Henri Poincaré (1854-1912), together with other pioneers in the field of dynamics such as Birkhoff and Kolmogorov, introduced the ideas of how non-linear deterministic systems could behave unpredictably and in an apparently chaotic way (Baets, 2007: 105).

More recent work from the Santa Fe Institute in New Mexico and Nobel Prize winners such as Ilya Prigogine (1917-2003) and Stuart Kaufman (1939-) further highlight the dynamic nature of living systems through non-equilibrium thermodynamics, far-from-equilibrium dynamics, dissipative structures and self-organization (Microsoft Encarta (4)).

As illustrated, the evolution from simplicity to complexity, or to be more precisely, from complexity, to simplicity and back again to complexity, is a shift from a set of conservative laws and reductionism to a perception of the world as an open and highly dynamic system.

Let us further investigate what characterizes the Complexity Sciences.

3.2.3 Complexity Science

The last section describes how the basis for complexity, in all respects, is founded on the emergence of knowledge within Natural Sciences (Dilworth, 1998: 497). The assumptions driving complex natural processes, for instance how relationships are the key determiner (Wheatley, 1999) and not the properties of the elements itself, are thought to be

representative for complex psychological and social processes investigated in Social Sciences (Cloete, 2006: 465).

Complexity as a research field may be approached in many different ways.

One is to look at complexity as a *science* in which self-regulated dynamical systems are investigated (Carlos, 2004: 50) and how non-linear dynamics affect specific systems (Carlos, 2007: 48).

A second way of interpreting complexity is to consider it as a *method of thought* in which it is taught to think in terms of relations (Carlos, 2007: 48), for instance how communicative processes of human relating is represented in the theory of Complex Responsive Processes (CRP).

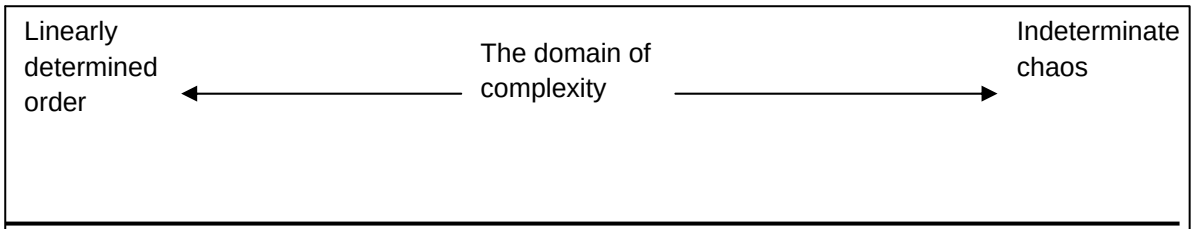
A third approach is to look at complexity as a specific *worldview* representing emergence and holism instead of the reductionism and determinism that characterizes the Newtonian paradigm (Carlos, 2004: 50).

However, it might be fruitful to consider these different perceptions as complementary and not competitive. A theoretical monism represented by one unified theory of complexity undermines the pluralism of living systems (Richardson, 2008: 17). Complexity thinking should instead, Najomanovich (2007: 104) argues, be presented as a radical and multidimensional transformation of how we perceive ourselves and our surroundings.

One aspect which is central in both Newtonian and Complexity Sciences, although with a totally different perspective, is the notion of order. De Villiers and Cilliers (2004: 48) state that the purpose of complexity thinking is to provide a framework to explain *how* complex systems may be ordered without external influences or internal centralized control.

The focus of complexity researchers is thus neither deterministic order, which may be represented by Newtonian logic, nor indeterminate chaos like some post-modern approximations (Heylighen et al, 2006: 9), but instead as defined by Waldrop (1992) on "*the domain between linearly determined order and indeterminate chaos".*

Hence, using the language labels provided by Darwin (2001: 485), the rainforest metaphor of complexity may be interpreted as the zone between the clockwork of Newtonian mechanics and the snake-pit metaphor of post-modern randomness (figure 8).



Clockwork (Newtonian)	Rainforest (Complexity)	Snake pit (Post-modern randomness)
Control	Complex	Chaos
Order	Order within chaos	Disorder
Modern	Constructivist	Postmodern
Objective	Interconnected	Subjective
Realist	Neither	Non-realist
Analytical	Evolving	Instinctive
Safe	Dynamic	Unsafe
Logical	Fuzzy logic	Illogical
Certain	Adaptive	Uncertain
Foundations	Web or net	No foundations
Predictable	Pattern	Unpredictable
One best way	Multiple approach	Any way
Structured	Codetermined	Unstructured
Planned	Memory of the future	Unplanned
Competitive	Co-evolution	Competitive

Figure 8 – Language labels (Darwin, 2001: 485) and the domain of complexity

Due to the wide scope of the Complexity Sciences a number of different schools have emerged representing different methodologies on how to understand and respond to complexity. This dissertation will now briefly describe the main approximations.

3.2.4 Schools of Complexity

A number of scholars present complexity as an objective characteristic of an organization's structure, for instance represented in terms of the number of parts and the diversity of these parts (Fioretti & Baker, 2004: 11). This view would be representative of a classical reductionist interpretation.

Within the Complexity Sciences principles from the classical reductionist paradigm have been integrated into a somewhat new wrapping named the *neo-reductionist school*, which may also be referred to as "hard complexity" and falls under Natural Sciences (Cilliers & Preiser, 2010: V).

The neo-reductionist approach rests considerably on the use of simulations, for instance bottom-up agent based modelling, through advanced technology. In principle the number of premises is quite similar to Newtonian rules, but instead of using linear models as in the more classical sense, non-linear models are the basis for application (Richardson, 2008: 19). It is a more complicated, but not complex[3], version of the simpler classical reductionism.

It may appear to be complex though, because the patterns presented are difficult for the naked eye to understand, but the emergent process is based on a set of rules and initial conditions in a closed system perspective. It does not allow emergence in a wider sense as the programmer must define some boundaries. Although reductionism, both classical and neo, has its clear limitations does not mean that the representations provided cannot be useful (Richardson, 2008: 16).

On the other side of the scale of the quantitatively oriented and monist theoretical neo-reductionist school, you find the qualitative and atheoretical *metaphorical school*, which also has the label of "soft complexity" presented by the Social Sciences (Cilliers & Preiser, 2010: V).

By using conceptual metaphors such as emergence, edge of chaos, far-from-equilibrium and other complexity symbols academics are provided with powerful lenses that enable them to "see" the patterns of complexity in social organizations (Richardson, 2008: 19-20).

The middle path between the neo-reductionist and the metaphorical school may be found in *the critical pluralist school,* which represents a focus on the balance between the *boundaries* of what we think we know and what we cannot know for certain, and what implications these

[3] Please see the next section on the discussion on what is simple, complicated and complex.

limitations have for our perception of phenomena (Richardson, 2008: 21). Hence, as important as the contribution to what we *can* explain is what we *cannot* explain.

The different schools present different foci on complexity and explanatory principles on how to address complexity. However, choosing a single discipline to represent such a broad, diverse and interconnected topic as complexity is not just a technical error, but also an ethical one (Cilliers, 2005: 260).

Interdisciplinary studies[4] characterized by pluralism, humbleness and open-mindedness (Richardson, 2008: 21), i.e. facilitating a complimentary understanding using all the schools, is not optional, but an absolute necessity as *"complex systems are difficult to research, difficult to measure, difficult to construct viable theories of,* [and] *indeed difficult to determine if or if not they are in fact complex"* (Goldstein, 2009*).*

In the debate of complexity it is important to distinguish between what is complicated and what is complex. Because these are two concepts that can easily be misinterpreted as being equivalent, this dissertation will now discuss the difference between what is simple, complicated and complex.

3.2.5 The Simple, Complicated and Complex

One could argue that the distinction between what is complicated and complex is merely a question of semantics, but implicit in these labels lies deep and fundamental differences. To start off one can use simple and complicated systems as symbols of something mechanistic and materialistic, for instance a car or a plain, while a complex system represents something living and natural, for instance the brain, a language or any social organization (Cilliers, 1998: 3).

Simple and complicated systems are both closed systems and to a large extent reflect something linear and causal, such as a Newtonian representation. The difference is in principle present in the number of variables of the system and the necessary level of knowledge or insight of the system in order to understand it. For instance, an internal combustion engine of a car (Cilliers, 1998: 2) is a metaphor for a simple system, while the whole production facility of a factory may be more complicated (Nilsson, 2007: 245). Both are representative of something mechanistic with clearly defined boundaries and causal chains

[4] "A process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline or profession" (Klein, 2004: 2)

of events, but may presuppose a different level of deconstruction in order to analyze them correctly. Both systems are, however, perfectly understandable.

Complex systems may, as presented at the start of this chapter, be interpreted as "*systems characterized by nonlinear interactive components, emergent phenomena, continuous and discontinuous change, and unpredictable outcomes*" (Zimmermann et al, 1998: 256). Compared with the deterministic behaviour of a complicated system and the possibility of analyzing the system in an objective and rational way, the dynamic and interconnected properties of any complex phenomena make it impossible to fully understand. These statements will be further elaborated upon in the next section where the characteristics of a complex system are presented.

One must also take into consideration what appears to be simple, but what *de facto* is complex or vice versa. A nut may for instance be perceived to be simple, but reveals high levels of complexity when examined more closely (Cilliers, 1998: 2-3). Simultaneously, a fighter jet has the capacity to perform highly sophisticated operations and may seem to be very complex, but can be fully taken apart and is therefore merely complicated.

In the previous sections of this chapter I have discussed different perceptions of complexity and illustrated some of the challenges connected to examining complex phenomena. In the following section I will contribute to further understanding of complexity by discussing the characteristics of complex systems.

3.2.6 Characteristics of a Complex system

When we are talking about complex systems, we are, in contrast to simple or complicated systems, talking about organic and dynamic systems. Hence, when we are discussing what constitutes biological life and natural systems, we are presenting what constitutes complexity and complex systems.

The first thing to highlight in this connection is the limitations of quantitative methodology as representation of complex systems. It may of course produce representations that are useful, but will always be incomplete, as a quantitative approach will never account for all the elements of a complex system. In order to do so the framework has to conserve the same level of complexity as in the system itself (Cilliers, 1999: 24). In other words, in order to model a natural phenomenon accurately, you must be that natural phenomenon. Instead,

Roodt (2007: 218) argues for a qualitative framework allowing emergence, co-existence and non-linear interactions as more suitable to understand complex systems.

The following characteristics of complex systems will be presented with an initial description of that given characteristic. In order to provide a deeper understanding two different empirical frameworks will be discussed in conjunction with each characteristic, the first being the human subject and our identity understood as a dynamic and interconnected concept of constrained differences (Cilliers, 2010) and the second being individuals as economic agents in a given national financial system (Cilliers, 1998: 6-7), in this case the Norwegian financial system.

The characteristics of complex systems will now be provided.

I. Complex systems consist of a *large number* of agents or elements (Cilliers, 1998: 3).

A sufficient number of agents, of any kind, must be present in order to facilitate complex behaviour. Johnson (2001: 77) labels this as “more is different” and exemplifies this by how large numbers of ants, although as isolated elements described as seemingly stupid, may exhibit complex behaviour.

Example 1: If we think of ourselves and our identity as a system of differences, constrained differences, and not as a singular and uniform concept, we consist of a large number of elements (Cilliers & De Villiers, 2001: 238; Cilliers, 2010: 13). The differences are not constituted as different parts as such, but as meanings distributed in a network (De Villiers-Botha & Cilliers, 2010: 35).

Example 2: In a given country there are usually a high number of economic agents, for instance in Norway with the population of approximately 4.8 million people all inhabitants are directly or indirectly participants in the financial system. One must also take into consideration other participants who do not have Norwegian citizenship, for instance tourists and trade companies.

II. The large number of agents has to *interact in a dynamic way* (Cilliers, 1998: 3)

A large quantity in itself is not sufficient to create complex behaviour. Most objects, for instance a chair, consists of a large number of atoms, but does not exhibit any complex behaviour. Each element must play a role in the transformation and replacement of other

elements (Capra, 2007) thus contributing in a dynamic way to the process of *autopoiesis*, the network of processes enabling self-generation (Wheatley, 1999: 20).

Example 1: The identity of a system (for instance a human being) is not static or at any time complete, but a dynamic and transformative concept constituted by the diversity of the system (Cilliers, 2010: 7, 14). Identity is determined in relational terms (Cilliers, 2010: 6), and is not meaningful in isolation (Cilliers & De Villiers, 2001: 238; De Villiers-Botha & Cilliers, 2010: 34).

Example 2: The participants in the Norwegian financial system interact continuously and in a dynamic way through buying and selling products, investing, lending and borrowing.

III. The interaction needs to be *fairly rich*, which means that one component must affect multiple other elements, not just one other component (Cilliers, 1998: 3-4)

Example 1: The dynamic and ongoing processes that contribute to our perception of identity are based on rich interaction both in terms of number of elements, but also the differences of these elements (De Villiers-Botha & Cilliers, 2010: 34). On the one hand few relationships will create many degrees of freedom, but on the other hand few constraints for the system, while a complex set of relationships will provide more nuances, with consequently less freedom, but simultaneously a more rich and varied structure (Cilliers, 2010: 10).

The phrase *fairly rich* thus points to the balance between absolute freedom (indeterminate chaos) and full constraints (determinate order).

Example 2: In the context of a financial system, an economic agent interacts with a relatively high number of other elements both through direct transactions, for instance buying groceries or paying bills in the bank, but also through indirect transactions by facilitating other economic agents' participation (for instance information sharing, influencing, manipulation etc.).

IV. The interactions must not only be dynamic and fairly rich, it must also be of a *non-linear character* (Cilliers, 1998: 4)

In principle without non-linearity everything would stay the same although in slightly different configurations (Sturmberg & Cilliers, 2009: 3) and complexity would not be possible (Cilliers, 1998: 4). Non-linearity enables small changes to grow into possibly big changes (Parker &

Stacey, 1997: 13) and ensures the system to be in a far-from-equilibrium state, ensuring new energy for survival (dissipative systems). The topic of non-linearity will be further elaborated later in this chapter.

Example 1: If the interactions were linear the identity of a person would remain ordered and stable (Cilliers, 2010: 7). However, different people and events do, have different impact on a person's identity (De Villiers & Cilliers, 2010: 34). For instance, your spouse will most likely affect your identity more than the neighbour you meet on the stairs every now and then. The interactions that make up the self is thus of a non-linear character (Cilliers & De Villiers, 2001: 239).

Example 2: If the interactions in- or the product of - a financial system would have been linear the input would be equal to the output. However, the value of a financial investment will over time most likely change either in positive or negative direction and the elements with which the economic agent interact will change. Both the process and the output will be of a non-linear nature.

V. The *interactions are relatively short ranged*, i.e. information is primarily received from agents in close proximity (Cilliers, 1998: 4).

This may understood in a spatial or non-spatial sense. On the one hand, one could think of it as our interaction with the agents that are within our physical reach, or on the other hand, one could think of it in a wider and more intangible sense, for instance as interaction facilitated through modern technology (phone, internet etc.).

The fact that the interactions are relatively short ranged does not, however, mean that they cannot have wide range impact. Through a dynamic and interconnected process organisms may exhibit clearly complex behaviour as a collective (Johnson, 2001: 77-78) and the non-linear character of natural systems may cause inherently small changes to have a big impact (Parker & Stacey, 1997: 13).

Example 1: The identity of a person may only be affected by the information that is available locally, for instance our interaction with people and things. "Local" is a relative term and also entails non-spatial elements such as stories, songs and books, which means that the local proximity may be interpreted as some kind of "first hand" encounter (De Villiers & Cilliers, 2010: 34).

Example 2: An economic agent, as with all other "natural" agents, interacts with its local environment, both interpreted in a spatial- and non-spatial way. For instance, one may buy groceries at the local shop or use applications on the internet to buy stocks.

VI. A complex system has positive and negative *feedback-loops* (Cilliers, 1998: 4).

Any action may feed back to the origin of the action influencing the initial settings (De Villiers et al, 2004: 49) where negative feedback is stabilizing and positive feedback is reinforcing, amplifying and destabilizing (Parker & Stacey, 1997: 25-26).

Example 1: Our identity is not a static and infinite concept, but is constantly transformed (Cilliers, 2010: 7). The choices we make may feedback on ourselves, but most likely with an unpredictable and unexpected outcome (Cilliers & De Villiers, 2001: 239-240.)

Example 2: The action made by an economic agent, for instance an investment, may evidently result in either good returns or negative returns when the investment is processed (Cilliers, 1998: 6).

VII. Complex systems are *open systems* that interact with their environment (Cilliers, 1998: 4).

A key characteristic of biological systems is that they are materially and energetically open (Capra, 2007) and develops through an emergent process of interaction. A closed system, on the other hand, exists in isolation and is characterized as either a simple or complicated system.

Example 1: The identity of a person or institution develops based on the interaction with its environment and is therefore not a closed system. The exact boundaries of livings systems are hard to define as the boundaries are dynamic and non-physical (De Villiers-Botha & Cilliers, 2010: 34).

Example 2: The financial system and the single economic agent are in a simultaneous process of shaping and being shaped by political-, socio-economical-, technical - and environmental factors and it is difficult to precisely determine where the financial system starts or ends.

VIII. Complex systems operate in a *far-from-equilibrium environment* (Cilliers, 1998: 4).

Biological life is dependent on a continual flow of energy in order to survive (Capra, 2007) and a state of equilibrium is therefore equivalent with stagnation and ultimately the slow death of the system.

Example 1: The self is an open system and thus never in a state of equilibrium (De Villiers-Botha & Cilliers, 2010: 34). The heterogeneity of an identity is a necessity for survival, not a convenience (Cilliers, 2010: 8). To reduce the identity to fixed relations and closed borders implies a rigidity which is detrimental (Cilliers, 2010: 14).

Example 2: The basis for a marked-driven economy is the dynamic relationship between supply and demand, something which will vary based on the circumstances. The market is in a continual process of change due to a myriad of interconnected variables and maintaining equilibrium would be nothing more than an astonishing (though counterproductive) achievement.

IX. *The history of a system is an important element* in a complex system (Cilliers, 1998: 4)

The history of a system is distributed over the entire system and is contained in the dynamic processes of interactions (De Villiers & Cilliers, 2004: 47). What becomes history, i.e. what *de facto* is manifested in the interactions, is filtered information from the environment which evidently becomes a part of the memory because it is thought of as significant (Sturmberg & Cilliers, 2009: 882). Hence, one can state that the past of a complex system is "*co-responsible for* [its] *present behaviour"* (Smith, 2007: 194).

Example 1: The identity is co-determined by the context and history of a person (Cilliers & De Villiers, 2001: 240). Every identity is unique, as no one shares completely identical history or context with anyone else (De Villiers-Botha & Cilliers, 2010: 35).

Example 2: Yesterday's stock prices will always affect tomorrow's prices, but will rarely be static due to tensions in the environment. Without taking history into consideration one would start at ground zero every day.

X. *Complexity emerges through interaction based on local information* (Cilliers, 1998: 4-5).

Emergence of complexity arises from the *interaction* between multiple elements of a system and cannot be traced back to the properties of the different elements (Stanley, 2009: 52). The opposite would be to state that complexity is an objective property that is designed and manufactured in a planned way.

Every element of a system acts based on local information which implies that the elements do not have a holistic view of the system. Assuming that each element would have had the total view of all the interactions of a system, a metaphor of something omniscient, would mean that all the complexity of the system would be present in that specific element, which clearly is not the situation.

Example 1: The self cannot have complete overview of its own history and all the interconnected variables representing the present context. Hence, we act based on local information and our limited understanding of the whole (either as the "self", institution or larger systems) (De Villiers-Botha & Cilliers, 2010: 35).

Example 2: Any decision of an economic agent, whether it is the banking director, financial analyst or the man buying gum at the local kiosk, is based on the local information that the economic agent possesses. Local information does, of course, vary and can for example reflect the institution's financial situation or the individual's need.

The second part of this chapter has discussed different perceptions of complexity, which it is worthwhile to summarize briefly.

- The wide scope and dynamic nature of complexity makes it difficult to present a general and uniform definition of what complexity exactly is or is not.
- The emergence of complexity thinking is a transformation from a set of conservative laws and reductionism represented by the paradigm of order, to a perception of the world as an open and highly dynamic system.
- Complexity Sciences represents a pluralist and interdisciplinary approach that in many regards bridges the differences between modernist and post-modernist traditions.
- There are different schools of complexity which mainly may be divided into "hard" and Natural Science oriented complexity in the neo-reductionist school, and "soft" and Social Science oriented complexity in the metaphorical school and critical pluralist school.
- Simple and complicated systems are materialistic, mechanistic and are also closed systems which are fully compressible and therefore fully understood. Complex systems, on the other hand, are living and open systems which are constituted by relations.
- Complex systems consist of a large number of short ranged interactions which are dynamic, non-linear and fairly rich. The patterns of the systems are codetermined through a dynamic process between the history of the system and the interaction with its local environment.

The next part of this chapter will more closely examine different conditions for complexity by discussing concepts such as emergence, non-linearity, disequilibrium, feedback and self-organization.

3.3 Part Three: Conditions for Complexity

The first remark in the examination of how to facilitate complexity is to state that these conditions are *necessary*, but not automatically *sufficient* conditions for the emergence of complexity. The presence of these conditions may contribute to complete randomness as well as complexity.

Emergence, non-linearity, disequilibrium, feedback and self-organization are concepts and/or properties that do not exist in isolation but is constituted through an interconnected and dynamic process of interaction.

The illustration of boundaries between the properties presented here is thus for pedagogical reasons and not as a representation of the relationship or the dynamics between its constitutive properties.

First to be described will be the condition of emergence.

3.3.1 Emergence

The dictionary will often describe to "emerge" as something that appears "*out of or from behind something*" (Microsoft Encarta, 2008 (5)).

Emergence is thus about how patterns (on all levels) arise as a result of interaction between parts of a system (Stanley, 2009: 52). These patterns are not a representation of the properties of the constituent parts, but abstractions, and often unexpected ones, which are constituted through the dynamic relationship between the parts (Richardson, 2008: 15).

The phenomena of emergence are *not* something artificial and distant that does not affect people in their everyday life. In fact, all things that matter for people in their every day life, for instance health, status and friendship, are emergent properties (Heylighen et al, 2006: 5).

However, emergent properties must *not* merely be understood as an accumulating process where something microscopic grows to be something macroscopic (i.e. a linear perception in terms of sequence (time) but non-linear in terms of process).

The emergent property is not an objective property which exists outside the system, but feed back into the system in which it originates, alters transformation within those systems, which ultimately may influence the emergent property (De Villiers & Cilliers, 2004: 47). It is thus a *circular* and *co-evolutionary* perception of phenomena.

A relatively antagonistic view to the focus on relationships, patterns and circularity in emergent phenomena can be found in the *atomism* of reductionism where the characteristics of the component, and our knowledge of these characteristics, is the cornerstone in understanding phenomena.

Holism, on the other hand, portrays a picture where the whole is not merely the sum of its parts, as a simple puzzle, but as something that exceeds the capacity of each component added together. Holism or *wholes* are real (Smuts, 1927: 88), but cannot be reduced to one single, and often materialistic, dimension (Klein, 2004: 4). Wholes *emerge* based on interaction between a number of variables, physical, biological, social, chemical and psychological (Heylighen et al, 2006: 12), including inorganic substances (Smuts, 1927: 88).

Smuts (1927) illustrates the interrelated and co-evolutionary relationship between parts and wholes, and how holism is a process of creative synthesis in the following way:

Taking a plant or an animal as a type of a whole, we notice the fundamental holistic characters as a unity of parts which is so close and intense as to be more than the sum of its parts ; which not only gives a particular conformation or structure to the parts, but so relates and determines them in their synthesis that their functions are altered ; the synthesis affects and determines the parts, so that they function towards the" whole " ; and the whole and the parts, therefore reciprocally influence and determine each other, and appear more or less to merge their individual characters: the whole is in the parts and the parts are in the whole, and this synthesis of whole and parts is reflected in the holistic character of the functions of the parts as well as of the whole (Smuts, 1927: 88)

Lichtenstein and Plowman (2009) argue that non-linearity, disequilibrium, positive- and negative feedback and self-organization are necessary conditions for facilitating emergence.

This dissertation will continue examining the condition of non-linearity.

3.3.2 Non-linearity

Perhaps the most obvious description of "non-linear" lays in the direct interpretation of the words, as something *"not lying on the same straight line"* (Microsoft Encarta, 2008 (6)). A development of this interpretation could be non-linearity as "*a relationship or function that is not strictly proportional"* (Microsoft Encarta, 2008 (6)).

In other words, there is an asymmetric relationship between what I do (input) and what I achieve (output), which could be with either with a positive or negative connotation.

As discussed in "characteristics of complex systems" earlier in this chapter, interactions of a non-linear character is a precondition for complexity (Cilliers, 1998: 4). Without non-linearity no interesting behaviour would arise as everything in principle would stay the same although in a slightly different configuration (Sturmberg & Cilliers, 2009: 3).

Galbraith (2004) presents some of the differences between a non-linear and linear system (table 3).

Property	**Linear system**	**Non-linear system**
Initial conditions	Not important	Very important
Equilibrium	Stability	Chaos
Prediction	Deterministic	Chance
Feedback	Negative	Positive

Table 3 - Difference between non-linear and linear systems - Galbraith, 2004: 14

The *initial conditions* of a system are very important in a non-linear system as it is *highly sensitive* to changes in these initial conditions (Parker & Stacey, 1997: 13). Small changes on a lower aggregation level *might* over time and in a highly non-linear way, grow to become big changes in a macro perspective. The much alluded to metaphor of how the flap of a butterfly's wings in Tokyo can affect a tornado in Texas is an illustration of how a small action globally speaking might amplify over time producing highly unexpected outcomes on a larger scale (Casti, 1994: 95; Wheatley, 1999: 121; Praught, 2002: 517).

Complex systems are open systems that operate in a far-from-equilibrium environment (Cilliers, 1998: 4). Survival in a non-linear system is therefore dependent on a continual flow

of energy (Capra, 2007) which is ensured by a continuous state of disequilibrium. Equilibrium is equivalent to a slow death of the system.

The meaning of the property of equilibrium is therefore different in a non-linear system than a linear system. Although it might seem a bit confusing, one could state that disequilibrium in a non-linear system *is de facto* nurturing the equilibrium of the system, a state of equilibrium interpreted as something dynamic. This is of course a semantic note. The property of disequilibrium will be further elaborated in the next section.

A linear and deterministic framework is inherently a predictable and causally oriented system, which is not representative for a non-linear system. *Causality* is specifically relevant to apply to systems which exist in isolation undisturbed by its environment (Baets, 2007: 107), for instance a simple or complicated system. Although causality may be possible to identify on a microscopic level, the *networked* paths of complex systems makes it impossible to identify and disentangle the contribution of each causal path on a macroscopic level (Richardson, 2008: 15).

It is important to stress the point that a non-linear system not necessarily implies that it is a complex system, but a complex system is always a non-linear system. For instance, Galbraith (2004: 14) states that prediction in a non-linear system is by chance (and thus randomness), while complex systems have structure which *inter alia* is manifested as emerging patterns (Darwin, 2001: 485).

Feedback refers to how any action may loop back to the origin of the action (De Villiers et al, 2004: 49). This feedback may be labelled negative, as in stabilizing, or positive as in reinforcing, amplifying and destabilizing (Parker & Stacey, 1997: 25-26). Linear systems will be oriented towards negative feedback, while non-linear systems are dependent on positive feedback (Galbraith, 2004: 14). Complex systems, on the other hand, must *balance* between positive and negative feedback in order to operate in "*the domain between linearly determined order and indeterminate chaos"* (Waldrop, 1992).

Non-linearity is an essential part of a complex system, whether that complex system is the brain, a language, a social system, because a complex system cannot be complex without it. However, there are a number of other aspects that are essential in understanding a complex system. This dissertation now continues by embarking on a discussion of the importance of disequilibrium as a prerequisite for emergence and complexity.

3.3.3 Disequilibrium

Disequilibrium is not a mandatory feature of complexity, but a precondition of complexity. Price (2004: 40), for instance, suggests that "[life is] *a property of improbable complexity possessed by an entity that works to keep itself out of equilibrium with its environment"* and Cilliers and De Villiers (2001: 235) state that *"a system survives (and also flourishes) in terms of tension".*

Two properties are natural to connect to disequilibrium, the first being "non-linear" that already have been described in the latter section, and the second being "chaos".

The most common (and Newtonian) view of chaos would be in the direct sense of the word as "*complete disorder and confusion*" (Microsoft Encarta, 2008 (7)), but it may also be defined as apparent disorder in the sense that *"apparently random changes occur as a result of the system's extreme sensitivity to small differences in initial conditions*" (Microsoft Encarta, 2008 (7)). The latter definition implies an added sense of underlying structure compared to the total randomness of the aforementioned.

Ilya Prigogine's work on *dissipative systems* is central in the explanation how disequilibrium actually creates equilibrium, or put differently, how chaos contributes to order. Dissipation refers to the gradual loss of energy from a system (Parker & Stacey, 1997: 37) which destabilizes- and creates opportunities for the system to flourish. Wheatley (1999: 115) looks to ancient Greek history to illustrate this point where Gaia is the symbol of stability and life, and Chaos, represents the endless abyss, who were partners in creating higher order.

Parker and Stacey (1997: 38-39) identifies some properties of dissipative systems.

1) They use positive feedback to amplify changes in the environment and thus dislocate existing patterns of behaviour.
2) They have self-organizational capabilities.
3) They make decisions at critical points, also called bifurcation points (Dilworth, 1998: 497).
4) They behave unpredictably (Parker & Stacey, 1997: 39).

Disequilibrium does not merely create imbalance; it provides incentives for the system to become *resilient*. Resilience may be thought of as the "*the system's ability to absorb perturbations and evolve into a meta-stable level of organization"* (Juarerro, 2007: 112-113). However, this meta-stability is stability interpreted as "*low fluctuation around specific states*",

but increased ability of system renewal (Juarerro, 2007: 113). The apparent instability is thus not something negative, but a precondition for emergent processes (Wheatley, 1999: 21).

Although disequilibrium is a precondition for survival of a system, it is simultaneously a prerequisite for the death of a system. A highly asymmetric system that does not have any *attractors* might cause too much disequilibrium which ultimately might push the system into a state of anarchy and total randomness (Uys, 2002: 38).

A complex system needs attractors, and these attractors might be divided into two main groups, fixed and strange attractors. Fixed attractors, which may be defined as "*a fixed point or state of equilibrium that the behaviour of the system is attracted to and tends to imitate*" (Microsoft Encarta, 2008 (8)), and is natural to associate with negative feedback and equilibrium seeking systems.

Strange attractors, on the other hand, are not fixed and rational; they are dynamic, irrational (strange) and behave unpredictably. Strange attractors might be referred to as multiple mobilization points which due to sensitivity to initial conditions serve as a catalyst for reshaping the whole system (Dilworth, 1998: 497; Parker & Stacey, 1997: 97). Osborn and Hunt (2007: 326) envision strange attractors as *a collection of variables that hold an inherently non-stable, non-linear system, such as an organization, together and give it shape"*.

The shape might be presented as patterns emerging over time as illustrated in figure 9. Concentrating on individual moments in a system reveals nothing else than symptoms, but observing the shape taking place over time reveals order and wholeness as patterns (Wheatley, 1999: 117-119).

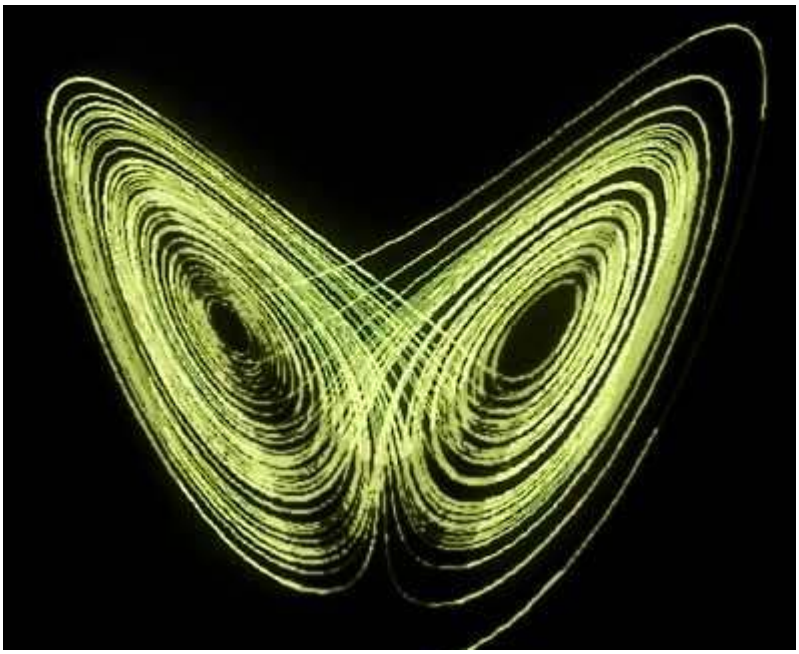


Figure 9 - Strange attractor (Microsoft Encarta, 2008 (8)).

An example of a typical fixed attractor would be a quantitative objective of a sales department, whereas the values, culture, ethics of an organization would be examples of strange attractors that trigger the system to adapt (Wheatley, 1999: 132).

Closely related to the discussion of emergence, non-linearity and disequilibrium is the role of feedback mechanisms in complex systems. This will now be discussed.

3.3.4 Feedback

Feedback refers to how any action might loop back to the origin of the action, affecting the initial settings and consequently changing the original action (De Villiers et al, 2004: 47, 49).

Some feedback will be stabilizing and equilibrium seeking, something one can call negative feedback, and other feedback will be positive, representing destabilization and reinforcement (Parker & Stacey, 1997: 25-26).

A complex system requires both positive and negative feedback (Cilliers, 1998: 4) depending on the state of the system. Complexity is described as the "*the domain between linearly determined order and indeterminate chaos*" (Waldrop, 1992) and a system state strongly tending towards linearly determined order requires positive feedback loops, while a state tending towards indeterminate chaos requires negative feedback loops.

According to Johnson (2001: 134) probability of feedback loops in a system is correlated with the level of interconnectedness in the system. A simple or complicated system will have a limited degree of interconnectedness due to the properties of these systems, while a complex system has an unlimited degree of interconnectedness (Casti, 1994: 271). In that sense one can state that there is a symbiotic relationship between complexity and feedback as both are pre-requisites for their existence.

Negative feedback is a means to keep the system in balance despite changing external conditions (Johnson, 2001: 138) and materializes in many shapes and sizes. A simplistic illustration of negative feedback would be how a central heating system functions which regulates the temperature (warming or cooling) depending on the gap between the current state (for instance 18 degrees) and the desired state (for instance 20 degrees). Positive feedback would, on the other hand, widen that gap making it increasingly warmer or cooler depending on the initial condition making the central heater either overheated (indeterminate chaos) or causing it to freeze (linearly determined order) (Parker & Stacey, 1997: 25-26).

The dissertation will now continue with an elaboration of self-organization as a necessary property to facilitate emergence and complexity.

3.3.5 Self-organization

The most obvious interpretation of the term *self-organization* would be that there is an absence of an external and centralized command that plans and executes actions. The lack of a pre-designed external design does not imply that the processes are chaotic and does not possess any structure. However, it may be perceived to be chaotic due to the complexity of the processes.

Cilliers (1998:90) describes self-organization as follows:

"The capacity for self-organization is a property of complex systems which enables them to develop or change internal structure spontaneously and adaptively in order to cope with, or manipulate, their environment".

The capacity of enabling spontaneous and adaptive reactions to tensions (disequilibrium) in the environment requires local interpretation and local action. In complex and self-organizational systems, as opposed to simple or complicated systems that have designed structures to obtain specific objectives, the structure is *emerging and networked*, and thus

based on the interaction between individual components reacting to local information (Fernandez et al, 2007: 177).

Some characteristics of self-organizing systems may be presented.

I. The structure of the system is not determined by the system's agents *or* the external environment, but the interaction *between* the system's agents *and* the external environment (Cilliers, 1998: 91).

In complex systems elements do not exist in isolation but contribute collectively in a networked and non-linear way to interconnection and co-existence between elements and the environment. In its confrontation with its surrounding environment each element has a number of opportunities of actions, it may for instance choose to ignore, manipulate or fully adapt to the tension from the milieu, but the interaction is always based on local knowledge. The single element does not possess a holistic view of the complexity, but act according to available information locally (Cilliers, 1998: 94; Johnson, 2001: 86).

II. Self-organizing systems are *neither good nor bad* (Johnson, 2001: 137).

Emerging and self-organizing systems do not possess any kind of a centralized moral or ethical compass to judge whether the systems grow into becoming something inherently good or bad. The agents of a complex system may interact with intentions, good or bad, but the entanglement of a large number of elements interacting in a non-linear, fairly rich and dynamic way make the pattern emerging highly unpredictable.

Self-organizational processes have the potential for great creativity, novelty and for nurturing resilience, but it may simultaneously lead to system failure and catastrophe (Morrison, 2010: 382).

III. Self-organizing systems are not isolated incidents, but *patterns emerging over time* (Wheatley, 1999: 125).

A reductionist and atomistic understanding of a system provides information, valuable information, but to study merely isolated parts and their properties does not provide a holistic view of the state of a system (Wheatley, 1999: 125).

Johnson (2001: 82) provides an adequate example of this by illustrating the life of ants and their ant-colony. A single ant has a relatively short life span and does not directly affect the

overall state of the ant-colony much during its life cycle. However, the state of the colony may exceeding many generations of ant, change dramatically as the colony as a collective gains more intelligence and become more structured. A similar analogy may be used for human development.

IV. The complexity of self-organizational systems *may increase over time* (Cilliers, 1998: 92).

An increasing number of interactions in a system over time will make the system more interconnected and thus more complex. In the early phases of a self-organizational system it is less resilient and is subject to greater possibilities of system death than a system that has developed over longer periods of time. Each individual component of a self-organized system reacts to local information on micro-level, which may translate into organized and complex behaviour on macro-level (De Villiers & Cilliers, 2004: 50).

The word “may” is however important to substantiate as a self-organizational process may also evidently lead to system death as deterministic order (equilibrium) or indeterministic chaos (randomness).

A self-organizational system tends to develop towards an optimum structure, something one can call *self-organized criticality* (Cilliers, 1998: 95-96). The “criticality” of this optimized and fine tuned system is that it is highly sensitive to initial conditions and any disturbance at this stage might bring about dramatic change, of which earthquakes and avalanches would be examples (Stanley, 2009: 51). However, it is not critical in a *negative* sense, but critical in the sense that it may trigger spontaneous and adaptive changes in the structure of the system due to tension.

V. A self-organizational system *grows* through *bottom-up processes* (Johnson, 2001: 67; Cilliers, 1998: 91).

A bottom-up process refers to how a self-organizational system over time may become resilient through interaction between agents on a low aggregation level that evidently may grow to manifest itself throughout the system. The system is thus not engineered to fit some pre-determined design, but develop in a disproportional- and often surprising way.

One could refer to bottom-up processes as an expression of *swarm logic* where individual components (for instance ants), which possess a relatively limited capacity as an individual agent, may over time produce great collective results by spontaneously changing structure

due to adaptive tension forced upon the system (Johnson, 2001: 74). This swarm-like behaviour is also observable in organizations where a set of simple rules create the basis for complex collective behaviour (Plowman et al, 2007: 350).

In the third part of this chapter I discussed different necessary but not automatically sufficient conditions for complexity. I argued that non-linearity and disequilibrium are preconditions to ensure a continual flow of energy to an organic system, but simultaneously that a sustainable system is in need of both stabilizing (negative feedback) and destabilizing (positive feedback) forces to be complex, i.e. to operate in "*the domain between linearly determined order and indeterminate chaos*" (Waldrop, 1992). Self-organization is presented as a property of complexity which enables the system to develop or change structure due to adaptive tension (Cilliers, 1998: 90), which in an interdependent way creates emergent patterns constituted through the dynamic relationship between local agents and the environment (Stanley, 2009: 52; Richardson, 2008: 15).

The next part of this chapter will be dedicated to discussing general implications of complexity for the further research of this dissertation.

3.4 Part Four: Implications for Further Research

The purpose of this dissertation is to develop a meta-competency model for leadership in complex military systems.

This chapter has, amongst others, discussed perceptions of complexity and conditions for complexity to emerge and it is worthwhile discussing some general observations on how these findings might affect forthcoming research before embarking on the elaboration of complexity and implications for leadership, military organizations and competencies.

A short discussion on organizational implications will finalize this part of the chapter.

3.4.1 General Observations

The following paragraphs will describe different propositions that will impact the further research of this dissertation.

Proposition 1 – Complexity entails multiple dimensions of reality

According to complexity thinking reality is not reducible to one single dimension (Klein, 2004: 4), but as a nexus of interrelated phenomena emerging through a co-evolutionary process between physical, biological, social, chemical and psychological variables (Heylighen et al, 2006: 12).

Reality is thus not merely materialistic, as a reductionist interpretation (Heylighen et al, 2006: 2), but also consists of abstract space filled with *"invisible, intangible, inaudible, tasteless and odorless"* fields, which together with physical objects co-create the present (Wheatley, 1999: 50-52; Ulanowicz, 2008).

The Heisenberg Uncertainty Principle, which illustrates how any act of observation is connected with the situation being observed (Cloete, 2006: 248), reveals the interconnectedness between the observer and the environment, and the difficulties of how precisely to differentiate between objectivity and subjectivity.

Hence, human beings are not in any way disconnected from phenomena, but are rather active agents in the emergent reality (Stanley, 2009: 51). However, our experience of reality is not complete in any sense (Richardson, 2008: 21), but is based on the interaction between the history of the system (our memory) and local variables. Stating otherwise would imply that all the complexity of the world would be encapsulated in yourself and that there could only be one true story (Dekker, unpublished: 10-11).

Reality then, from an individual point of view, is a question of *perception* (Samiolenko, 2008: 43), a *perception* that is filled with enormous gaps or blind spots in terms of knowledge of the whole. In order to deal with this complexity, human beings have to reduce the complexity into something that is understandable (Cilliers & Preiser, 2010: vii), something one can call *perceptual completion*, a kind of "filling in" of information by the brain in order to compensate for any lack of information (Stanley, 2009: 49).

Since reality, as this dissertation argues, is an emergent phenomenon, every moment of reality is in principle a unique moment and thus a moment of surprise (Stanley, 2009: 49-50).

Proposition 2 – Complex phenomena are vague

The non-linear and networked paths of a complex system make it impossible to predict precisely the outcome (Richardson, 2008: 15). This would mean that all complex systems to some extent are inherently vague (Goldstein, 2009).

Vagueness does not mean that it is weak or inherently unclear (Goldstein, 2009: vii), in fact it is quite the opposite; it is merely an acknowledgement that there are limitations to our knowledge and understanding of phenomena. Hence, the absence of a bombastic and assertive position does not imply that the concept being described is deficient, just as the technique of an impressionist artist is not equivalent to absence of precision (Goldstein, 2009: ix), it is a *modest* and *responsible* position cautious about the impact of the claims being forwarded (Cilliers, 2005: 256).

A more assertive and seemingly "complete" representation would symbolize a rule based, static and closed environment (Juarerro, 2007: 110), but it is of questionable relevance to present a given output based on a set of rules when the output to some degree is decided by rules to which we do not know (Osberg, 2008: 220). One may also claim that a bombastic and "clear" description of a system inherently substantiates a perception of a system as fossilized and non-adaptive, as the source of adaptive capability is found in what is not rigid (Allen et al, 2010: 52).

We cannot, however, and this is the dilemma, do without incomplete representations as there is no objective way of reducing complexity (Cilliers & Preiser, 2010: vii) to our level of understanding and simultaneously conserving the level of complexity intact. This does not mean that an incomplete representation may not be useful, but merely acknowledges that there are limitations in terms of what we can know for certain (Richardson, 2008: 13).

The challenge is thus not to do without these incomplete representations, but to alter the purpose and status of these representations from something that is assertive and bombastic, to something that is provisional and vague (Osberg, 2008: 218). Our understanding of phenomena, and the representations providing this knowledge, goes hand in hand (Osberg, 2008: 218). It is an emergent property.

The discussion on vagueness and incomplete representations is highly relevant for the next proposition: the role of boundaries in emergent complex behaviour.

Proposition 3: Complex behaviour is dependent on enabling boundaries

Real systems must be bounded, or else no meaning could emerge since the potential play of difference between all the interacting elements in an open and complex system is unlimited (Cilliers, 2010: 8).

A boundary, in a complexity setting, is not thought of as something static, absolute or something clearly dividing components from each other, as would perhaps be a classical understanding thereof. A boundary emerges and is both a function of the descriptive perspective of a system, the *de facto* activity and normative perspective, the strategy of description (Cilliers, 2005: 610).

To state that a boundary has emerged is not the same as to say that we can accurately describe or define this boundary or that the current knowledge of the boundary will stay that way. The boundaries are inherently provisional, dynamic and never in any sense complete. This would mean that the system is closed and by implication rigid. It is in what is *not* complete, the gaps in the boundary, that the system finds incentives that enables transformation of the system (Allen et al, 2010: 52; Cilliers, 2010: 10).

One must think of boundaries as something which *enables* the system to connect with its environment and not as something that confines the system by clearly separating components. The enabling capacity of boundaries is thus not merely something physical, but increasingly communicational, behavioural and functional (Cilliers, 2005: 611).

Another important perception is that boundaries are not necessarily contiguous, but must be understood from a *non-spatial perspective*. Elements of a complex system may exist and interact from different spatial positions, for instance in virtual space, and any element may take part in different systems concurrently. Put differently, systems share elements and interpenetrate one another (Cilliers, 2005: 611), which tells us that a boundary of a system can not in any way be identified as final, complete or objective (Cilliers, 2005: 612) and that different boundaries interact with each other.

The boundaries of a system are acknowledged, manipulated and/or altered through the rich interaction between elements of a system. Strange attractors, "*a collection of variables that hold an inherently non-stable, non-linear system, such as an organization, together and give it shape"* (Osborn & Hunt, 2007: 326), are examples of provisional and dynamic boundaries of a system which simultaneously enables and constrains the behaviour.

Another enabling property of complexity is heterogeneity, something the next proposition will elaborate on.

Proposition 4: Heterogeneity enables complexity

Complex systems are open systems that operate in a far-from-equilibrium environment and whose large number of elements interacts in a dynamic, fairly rich and non-linear way (Cilliers, 1998: 4-5).

Heterogeneity, or similar labels such as asymmetry, disequilibrium, difference and diversity, is not only a prerequisite for the emergence of complexity, it is precondition for any interesting behaviour to arise (Cilliers, 2010: 5).

A more limited and homogenous approximation might be perceived to be less risky and imply less friction than a more heterogeneous approach, but is potentially more vulnerable and subject to internal competition (Allen et al, 2010: 56). A more varied and rich structure generates a more unique identity (Sturmberg & Cilliers, 2009: 882; Cilliers, 2010: 4) and micro-diversity of identities facilitate more resilient and higher performing systems (Allen, 2010: 56). This is due to better ability to absorb perturbations (Juarerro, 2007: 112-113) and the capacity for spontaneous change of internal structure as a result of to adaptive tension (self-organization) (Cilliers, 1998:90).

The adaptive capacity does not however simply equal a large number of different agents. Meaningful behaviour is only possible when the large number of different agents (heterogeneity) interacts (Cilliers, 2010: 9-10). These interactions enable meaningful behaviour as the interactions constrain each other (Cilliers, 2010: 10). In other words, the interactions, manifested in patterns as for instance strange attractors, are simultaneously curtailing and enabling development of a sustainable structure (De Villiers & Cilliers, 2004: 47; Cilliers, 2010: 10).

Too many degrees of freedom in a system might open the way for an infinite number of opportunities, but this freedom simultaneously increases the possibility of randomness and anarchy (Cilliers, 2010: 9). Complex behaviour precludes constraints, but on the other hand a fully constrained system has no capacity for complex behaviour (Cilliers, 2010: 9). A *sustainable* and *resilient* system is thus enabled through a *richly constrained play of difference by a rich identity* (Cilliers, 2010: 14).

Put slightly differently, and perhaps too simplistically, the adaptive capacity of an organization will increase if the composition is heterogeneous (a rich collective identity), and interacts in a disproportional, dynamic and rich way (a play of difference) constraining the individual and systemic behaviour.

The constraining play of difference is obviously not just a play between the human agents of an organization, but also incorporates the contextual environment which together constrains and enables the development of structure (De Villiers & Cilliers, 2004: 47). A highly complex context requires more diversity and complex behaviour from the organization that is required to perform in that context (Cilliers, 2010: 4), while a less complex context requires less diversity. For instance, the production facility for tooth-brushes (which is more complicated then complex), requires less play of difference than knowledge driven military units in international operations.

The latter propositions have highlighted the fundamental uncertainty, vagueness and an element of surprise in complex systems. Adaptive capacity is thus essential to "cope" with complexity, but in a somewhat "bounded" way as the next proposition will present.

Proposition 5 – Complexity requires "bounded" adaptive capacity

Complex systems require both positive and negative feedback loops (Cilliers, 1998: 4), which stabilizes or destabilizes the system in order to operate in *"the domain between linearly determined order and indeterminate chaos"* (Waldrop, 1992).

Allen et al further illustrate this point.

"The idea is completely fundamental. All evolved systems need to accomplish two almost opposite tasks if they are to persist over a long time. First they must develop an internal structure of interacting identities that can together do something currently that allow them to pump resources in to maintain and grow their structure. Secondly, however, they must be capable of creating and transforming these identities and they do, in order to deal with a changing world" (Allen et al, 2010: 51).

Hence, a system needs an adaptive capacity in order to alter its structure to changing circumstances, but simultaneously it must be somewhat bounded or else the system would merely be a reflection of its environment (Cilliers, 2010: 14). So, the system must maintain some kind of stability, and thus make choices to ignore some of the dynamic of the system,

while simultaneously being flexible enough to enable adaptation when it is necessary (Sturmberg & Cilliers, 2009: 883).

The memory and knowledge of the system, depicted as a dynamic and networked system (Klein, 2004: 3), is thus subject to a *process of selection* (Sturmberg & Cilliers, 2009: 882; Ulanowicz, 2008: 117) based on our mutual transactions with the environment that over time becomes increasingly relevant for us (Osberg et al, 2008: 224). The absence of selection would by implication mean that all relationships in a networked structure would be maintained and the system would have no incentive to change (Sturmberg & Cilliers, 2009: 882).

"Bounded" adaptive capacity is dependent on selection, which would mean that the system will naturally need to change at slower rate than its environment (Cilliers, 2010: 14). A rich and resilient structure thus requires a *certain slowness* in its development as too rapid development will drain the resources of the system (Sturmberg & Cilliers, 2009: 883).

This is not exactly the same as saying that the system should never react rapidly, it merely emphasizes the point that an *appropriate* reaction from a system (which sometimes is quick) is dependent on a rich structure, a structure of richly constrained play of difference by a rich identity (Cilliers, 2010: 14), which has developed at a relatively slower rate that in its environment (Sturmberg & Cilliers, 2009: 883).

The argument for a "bounded" adaptive capacity is not just a normative discussion; it is also a pragmatic one. The absence of appropriate adjustment does not solely increase the risk of unethical actions (normative) and but also potentially devastating actions (pragmatic), as we are not synchronized with the values and norms surrounding us (De Villiers-Botha & Cilliers, 2010: 36).

The last general proposition of this section discusses the essential focus on relations as the basic unit of any living system.

Proposition 6 – Complexity requires a fundamental relational focus

Complexity requires short ranged and non-linear *interactions* that are dynamic and fairly rich (Cilliers, 1998: 3-4).

The basic unit of analysis is thus not the elements themselves and their properties, as would represent a more reductionist and materialistic point of view, but the process in which elements meet, interconnect and change (Wheatley, 1999: 34, 37).

Any interaction between human agents is subject to choices of reaction and action, for instance to follow blindly, slightly modify or ignore the arrangement, and through feedback loops these choices have the potential to modify the self-organizational dynamic of an organization (Osborn & Hunt, 2007: 326).

Human relating is fundamentally communicative and a simultaneous co-creation of individual and collective identities (Aasen & Johannessen, 2009: 24; Simpson & Gill, 2008: 48). These processes are both *creative* and *destructive* by nature (Stacey, Griffin & Shaw, 2000: 189-190) and subject to the intrinsic property of power (Aasen & Johannessen, 2009: 24).

The organizational implications will now shortly, and by no means exhaustively, be discussed.

3.4.2 Organizational implications

As a starting point it is reasonable to perceive the behaviour of a social organization as simultaneously equilibrium seeking and non-equilibrium seeking (Cilliers, 2010: 15; Allen et al, 2010: 51). It is the symbiosis and balance between these rather paradoxical approaches that provide incentives for dynamism and lay the foundation for operating in the domain of complexity.

The vagueness of complex systems impose strong limitations on *predictability* and the relevance of *long term* detailed blue prints or external designs are by implication limited[5] (Stacey, Griffin & Shaw 2000: 123-124; Stacey, 2006: 138).

A great deal of organizational *flexibility* is required in a complex and open milieu. One may argue that a too strong centralization of control, which requires a lot of power in terms of rules and formalization, will make the system too rigid (Collier, 2007: 89). On the other hand the distribution of control to the whole system will demand less power and increase the adaptive capacity due to greater resilience (Collier, 2007: 89).

Emergence does not imply that organizational life is by randomness or any way chaotic. Complex systems are *highly rule-governed systems* (Johnson, 2001: 181) and complex systems have structure and boundaries. The rules are, however, simple rules of interaction, for instance that we are all *participating elements* and that any organizational action must be *assimilated* into the local interactions to have any kind of validity (Stacey & Griffin, 2005: 9-10).

[5] Short term developments due to decisions are to some extent more predictable as it takes time for complexity to grow from small changes in the initial conditions.

Smith (2004: 77) argues that some of organizational attributes for successful organizations are that they work on the development of the informal relationship system, facilitate working on the edge of chaos and accept the growth of complexity from simplicity.

These attributes are further described by Kiel (1994) who distinguishes between properties for purely equilibrium seeking organizations in addition to organizations seeking to develop their self-organizational capabilities (table 4).

Attribute	Equilibrium seeking	Self-organizing
	Macro level properties	
Culture	Unified equilibrium	Diversified far-from-equilibrium
Strategy	Adjustment	Continuous emergence
Planning	Stable goals	Continuous bifurcation
Structure	Flattened	Process structure
Distance from client	Remote	Involved participation
Environmental fluctuations	Damping	Creative response
Work force demographics	Mandated diversity	Intentional diversity
	Micro level properties	
Work teams	Stable	Unstable
Control mechanisms	Defined tasks	Bounded instability
Work process	Sequential	Re-engineered parallelism
Process analysis	None	Activity based costing
Variations in systems	Source of error	Source of learning
Change process	Incremental re-stabilization	Perpetual innovation
Chaos	As excuse	As opportunity

Table 4 - Attributes of organizations (Kiel, 1994: 186-187)

In part four of this chapter I have made some general observations formulated as propositions on how the findings of this chapter might affect forthcoming research. Some

organizational implications have also been highlighted, something which will be discussed in more detail in chapter 4 and 5 of this dissertation.

It is now left for us to summarize the most significant findings of this chapter.

3.5 Summary

This chapter has attempted to attain research objective 1, which is *to define and describe a Complexity Approach and differentiate it from what is understood by an orthodox Newtonian Theory*.

In order to achieve research objective 1 the dissertation divided research objective 1 into multiple sub-objectives. The main findings of this chapter are linked to the different sub-objectives.

Research objective 2.1: To describe the Newtonian Approach and its general implications.

A Newtonian Approach is governed by principles that allow complete representation of phenomena and thus prediction and control.

The first of these principles is *reductionism* which rests on the assumptions that by understanding the basic property of a system you will be able to understand the system as a whole. *Determinism* is the second principle. It maintains that behaviour may be fully predicted. The third principle is *closed system thinking* where phenomena are thought to exist independent of their environment.

Research objective 2.2: To describe and discuss different perceptions of complexity

Complexity may not be too precisely defined, as would contradict the dynamics of complexity. However, the most commonly known definition of complexity is offered by Waldrop (1992) who illustrates the boundaries of complexity by referring to it as "*the domain between linearly determined order and indeterminate chaos".*

The evolution from simplicity to complexity is a shift from a set of conservative laws and reductionism to a perception of the world as an open and highly dynamic system.

Complexity may be perceived to be, amongst others, a science, a method of thought, a specific worldview or perhaps more accurately a combination of all of the above. From a more meta-perspective one could state that the complexity sciences represent a bridge between modernism on the one hand and post-modernism on the other hand.

There are different schools of complexity. These may be categorized as the neo-reductionist school, the metaphorical school and the critical pluralist school, each representing different foci on complexity.

It is important to differentiate between what is simple, complicated and what is complex. Simple and complicated systems are materialistic, mechanistic and closed systems which are fully compressible and therefore fully understood. Complex systems, on the other hand, are living and open systems which are constituted by relations.

Research objective 2.3: To describe and discuss what the characteristics of a complex system are.

Complex systems have different characteristics, for instance they consist of a large number of short ranged interactions which are dynamic, non-linear and fairly rich. The patterns of the systems are codetermined through a dynamic process between the history of the system and the interaction with its local environment.

Research objective 2.4: To describe and discuss different conditions for complexity

Emergence is about how patterns over time develop as a result of interaction between parts of a system.

Non-linearity refers to something being disproportional and is essential for complexity to grow from simplicity.

Disequilibrium, for instance non-linearity and chaos, provides incentives for change and keeps a system far-from-equilibrium.

Feedback refers to how any action might loop back to the origin of the action, affecting the initial settings and consequently change the original action. This feedback may be stabilizing (negative) or destabilizing (positive).

Self-organization may be referred to as " […) *a property of complex systems which enables them to develop or change internal structure spontaneously and adaptively in order to cope with, or manipulate, their environment*" (Cilliers, 1998: 90).

These conditions are necessary, but not automatically sufficient conditions for the emergence of complexity.

Research objective 2.5: To present proposals for general implications of complexity

Based on the literature presented in this chapter this dissertation articulates proposals which impact the further research of this dissertation:

Proposal 1: Complexity entails multiple dimensions of reality
Proposal 2: Complex phenomena are inherently vague
Proposal 3: Complex behaviour is dependent on enabling boundaries
Proposal 4: Heterogeneity enables complexity
Proposal 5: Complexity requires “bounded” adaptive capacity
Proposal 6: Complexity requires a fundamental relational focus

The next chapter will examine complexity in a leadership framework.

Chapter 4: Complexity and Leadership: A Conceptual and Theoretical Analysis

The purpose of this chapter is to discuss the implications of a Complexity Approach for leadership.

The previous chapter illustrates the principles which a Complexity Approach represents and the fundamental differences compared to a traditional Newtonian Approach. These seemingly antagonistic, but simultaneously complimentary approaches imply different things in terms of applications to the Natural- as well as the Social Sciences. This is something which also appears in the Management and Leadership Sciences. In this connection this dissertation finds it relevant to state the following research objective.

Research objective 2: To investigate the implications of a Complexity Approach on leadership and how it differs from the traditional characteristics of leadership.

In order to achieve research objective 2 this chapter is divided into multiple sub-objectives:

Research objective 3.1: To define leadership.

Research objective 3.2: To describe and discuss the traditional approach to leadership.

Research objective 3.3: To describe the link between a traditional approach to leadership and Newtonian Principles.

Research objective 3.4: To discuss a Complexity Approach to leadership

- Research objective 3.4.1: To discuss and propose the context of a Complexity Approach to leadership
- Research objective 3.4.2: To discuss and propose leadership roles in a Complexity Approach
- Research objective 3.4.3: To discuss and propose leadership behaviour in a Complexity Approach
- Research objective 3.4.4: To discuss an empirical example of a Complexity Approach to leadership

Research objective 3.5: To summarize the most important points of the chapter

This chapter is organized into two main discussions, a Traditional Approach to leadership and a Complexity Approach to leadership. The first discussion will be initiated with a brief section on the various existing definitions of leadership. Then, with the intention to link the Traditional Approach to leadership with a Newtonian worldview presented in chapter 3, this dissertation will describe and discuss main aspects of a Traditional Approach to leadership and its general implications. The second topic of discussion is a Complexity Approach to leadership which will be organized as proposals in three different categories; context, leadership roles and leadership behaviour. In addition, an empirical example of a Complexity Approach to leadership will be provided using Al-Qaeda as the starting point. Finally the most important features of this chapter will be highlighted through a summary.

The work presented in this chapter is substantively based on the research done by Rønn (2009) which was presented in the Master's dissertation "An investigation into the worldview of a selected group of Norwegian Army Cadets from a complexity and leadership perspective" completed at the University of Stellenbosch, South Africa.

4.1 Traditional Leadership

This part of the chapter will be organized in three sections that are initiated with a discussion of definition of leadership. This is followed by a presentation of main principles in what may be perceived to a traditional approach to leadership. Finally, a traditional approach to leadership will be linked to a Newtonian conception.

4.1.1 Definition of Leadership

Contemporary leadership literature reveals a high number of different definitions of leadership. The fact that there exists no uniform and generally accepted definition of leadership provides a clear symbol of the multi-faceted, intangible and dynamic nature of this field of research. Despite these observations, let us take a look at some of the definitions provided by the literature.

Katz and Kahn (1978) quoted in Schneider and Somers (2006) define leadership *"as incremental influence over and above compliance with routine direction".* The same authors highlight the formal side of leadership referring to leadership as the "*incremental influence of position holders exercised via direct and indirect means to maintain and/or alter the existing dynamics in and of a system"* (Katz & Kahn, 1978).

Johnson and Johnson (2006: 168) also state that leadership is about influence, but focus on the outcome generating more effective and better working relationships among members. The social focus is also supported by Dubrin (2007: 2) which defines leadership as "*the ability to inspire confidence and support among the people who are needed to achieve organizational goals".* Yukl (1981: 2) emphasizes goal-obtainment as the desired outcome of leadership by arguing that leadership is "*the behaviour of an individual when he is directing the activities of a group toward a shared objective"*.

The common denominator for the majority of traditional definitions of leadership include that there is interaction between two or more people, where intentional influence is present by one person over a another person or persons (Fox, 2005: 4).

There is a trend among leadership literature to distinguish between management and leadership. Management is considered to be something technical, for instance planning, organizing, directing and monitoring, while leadership on the other hand concerns the human element (Dubrin, 2007: 4-5).

This dissertation does not make any distinction between leadership and management for several reasons. First of all, the boundary between leadership and management is highly artificial and inhibits a holistic perspective of leadership. Secondly, leadership and management are highly interconnected. Hence treating them as two separate concepts may be misleading (Taylor, 2005: 140). Third and in support of the two abovementioned points, leadership and management support the same basic and emergent process of local interaction between interconnected agents (Boal & Schultz, 2007: 412).

This dissertation will now continue with a description of a traditional approach to leadership.

4.1.2 A Traditional Approach to Leadership

The first step in describing a traditional approach to leadership is to acknowledge that not one uniform traditional approach to leadership exists. The vast amount of literature on the field of research illustrates the impossibility of developing a single integrated theory of leadership (Osborn & Hunt, 2007: 337). Contemporary leadership theories thus represent simplifications of realities (as majorities of theories do) aimed at describing specific aspects that might provide further insight into the dynamic leadership debate.

This dissertation will now provide an overview of central aspects of contemporary leadership theories.

General Systems Theory (GST) is the foundation for the traditional leadership- and organizational research (Schneider & Somers, 2006: 352-353). Leadership research has been manifested in approaches such as a situational approach, power-influence approach, trait approach, behavioural approach and transformation approach.

The situational approach to leadership, such as the Situational Leadership Theory by Hersey and Blanchard (1977), describes how a leader who is influenced by the characteristics of group members should act in accordance with the situation (Dubrin, 2007: 145).

The power-influence approach to leadership focuses on what power the leader has available and how the leader exercises the power over its subordinates (Yukl, 1981: 7).

The trait-approach to leadership puts emphasis on traits specific to the leader and how these characteristics make him/her a leader (Yukl, 1981: 7). These traits can by physical, e.g. appearance, or mentally such as intelligence (Schwella, 2008: 17).

The behavioral approach to leadership has a lot in common with the situational approach to leadership, but states that the leader should always focus on both task- and relationship behaviour, while the situational approach argues that the leader might only focus on one of them or none, all depending on the situation (Schwella, 2008: 18). The importance is thus not the amount of power or what traits the leader has, but what the leader *de facto* does.

The transformational - or charismatic approach to leadership emphasizes that leaders should inspire and motivate the organization for the pursuit of a shared and powerful vision (Schwella, 2008: 18-19). As such, the leader is *the* essential part of the organization's capability to achieve goals.

In the execution of leadership, the two poles of autocratic approach and democratic approach is identified. The autocratic perspective is leader focused, masculine and task-oriented, while the democratic perspective is people-centred, feminine and relationship-oriented (Fox, 2005: 92; Park, 1997: 168; Park, 1996: 13). The task-orientated style is again linked to what Rowe and Mason (1987) refer to as the *directive and analytical decision style*, which emphasizes masculine values like practical orientation, authoritarianism, impersonality, intellect and control-orientation. The relations-oriented leadership style, however, is associated with the *conceptual and behavioural decision style*, which emphasizes traditionally feminine values like being flexible, adaptive, sociable, friendly and supportive (Park, 1996: 13-14).

As discussed in the previous chapter, rational thinking is one important pillar in a Newtonian Approach. This pillar can be identified in the rational approach to management (figure 10).

The model is divided into three different categories, discovery, choice and action. The initial *discovery* phase emerges owing to the fact that a gap exists between desired- and actual output due to changing circumstances. By collecting all relevant *facts* about the changing circumstances and analyzing their relevance there is a basis to generate viable options in the *choice* phase. The intention with the choice phase is to articulate objectives and generate cost-effective and feasible options to restore the gap and imbalance caused by the changing circumstances. The *action* phase is the implementation of the chosen option into instance policies, regulations or protocols (Parker & Stacey, 1997: 49-52; Edvardsen, 2000: 265).

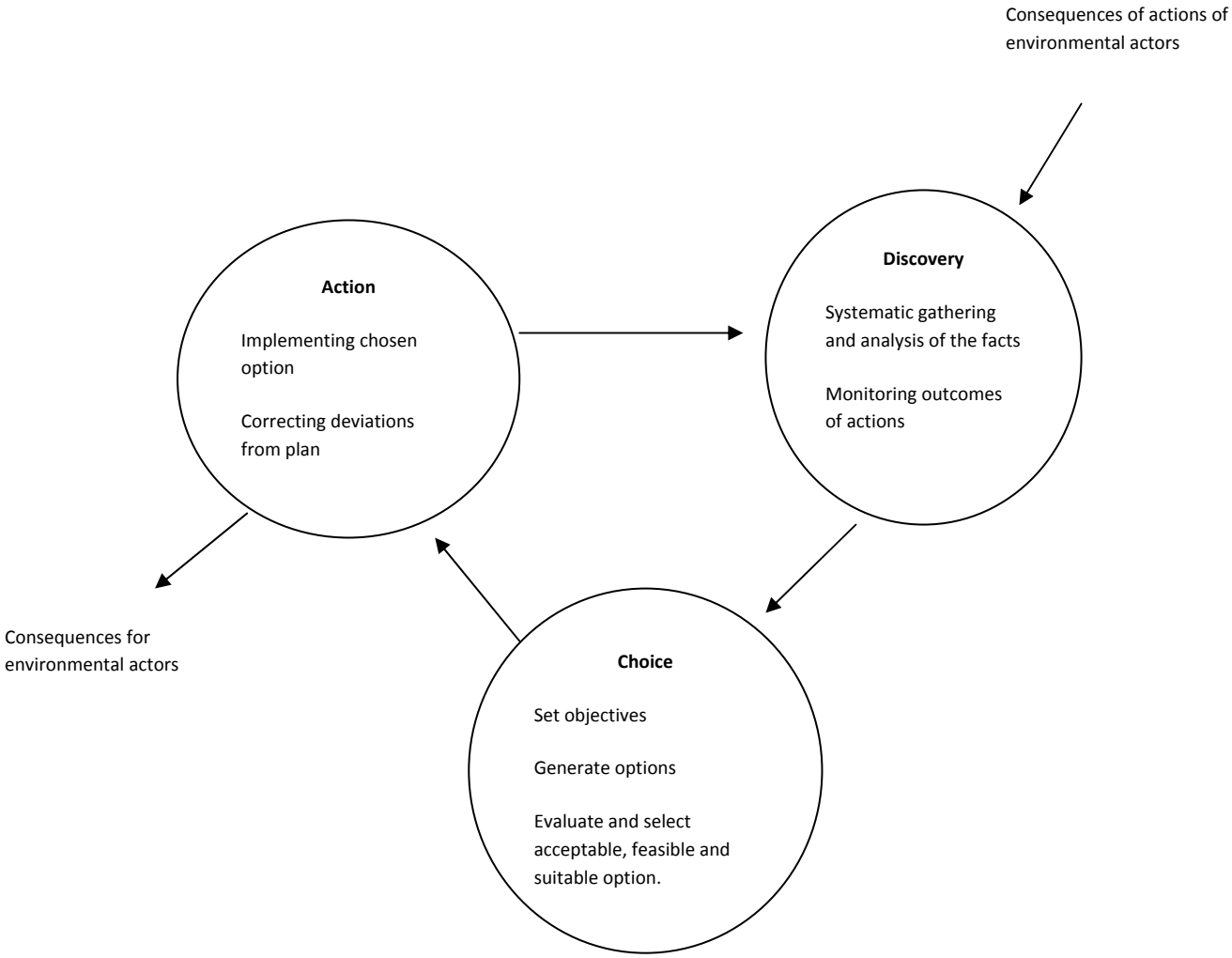


Figure 10 - The rational approach to management (Parker & Stacey, 1997: 51)

The rational approach to management is a "step-by-step" model on how to *manage* change following specific procedures. The model is causal and does not take into account the impact of the environment or social aspects *in the process*. Objectives are articulated and alternatives are chosen based on assumptions of predictability and forecasting of the future. The best strategy is thought to be the "best fit" between the *de facto* situation and the desired

futuristic output. Hence, this approach symbolizes a relatively closed system's perspective where the main objective is to restore balance through negative-feedback mechanisms.

Some generalized observations can be made based on the discussion of the traditional approach as it is presented in this dissertation:

- The leadership perspective is highly person-centered and does not take into account system dynamics of leadership.
- The leadership perspective acknowledges relationships between the leader and the subordinates but mostly through the perspective that a leader *influences* its employees. Less emphasis is thus put on the interaction itself.
- The leadership perspective supports mostly a top-down process of leadership where the leader is thought to be the initiator, director, controller and evaluator.
- The leadership perspective emphasizes rational processes and a relatively closed-system-view where the external environment and social interaction is of less relevance.

Given the generalizations on the traditional perspective on leadership the question arises as to how this approach relates to the literature previously presented. In the next section the relationship between the Traditional Approach to leadership and the Newtonian Approach will be examined.

4.1.3 A Traditional Approach to Leadership and Newtonian Principles

A traditional approach to leadership is anchored in Western philosophy and Newtonian Principles (Fernandez et al, 2007: 181-182). Thinking back to the discussion around Newtonian Principles in the previous chapter a number of key assumptions were identified, the most essential of these being reductionism, determinism and objectivity:

- Reductionism is based on an atomistic view where the whole can be understood by analyzing its parts.
- Determinism refers to how principles of linearity and causality help predetermine future events.
- Objectivity is closely linked to the notion of rationality and the lack of a link between observer and observed event (Heisenberg Uncertainty Principle).

Uhl-Bien, Russ and McKelvey (2007) argue that the main purpose of traditional leadership is to optimize the organization through effective and efficient formal procedures based on objective and rational organizational processes. Plowman et al (2007: 341-343) further state

that a traditional approach to leadership assumes that the future is predictable and the organization is a mechanistic place that demands prescribed rules, a high degree of formalized power and hierarchical authority (Plowman, 2007: 343). The environmental uncertainty that might exist is to be counteracted by creating sufficient organizational "buffers" to maintain stability despite fluctuations (Osborn & Hunt, 2007: 333). Hence, change is looked upon as something one must be defended against, not as a source of opportunity.

The organizational processes aim at maintaining or creating equilibrium through means such as planning, implementation and monitoring/evaluation (Stacey & Griffin, 2005: 3). A shared assumption is thus that leaders *actively shape* the future through deterministic and top-down processes. In other words, the bottom-up processes and the interaction between human beings and the environment are of less importance (Plowman et al, 2007: 343-344).

The principles presented so far are in many ways connected to a view of the organization as a simple or complicated system (see discussion in previous chapter). The organization operates in a relatively closed environment and the objective is to optimize functions through incremental processes and create stability and predictability. Bearing in mind the characteristics of a complex system, the view presented in this paragraph clearly offers a mismatch.

Although the underlying assumptions of a traditional approach to leadership might be less relevant in a Complexity Approach it does not automatically mean that the actual execution of leadership from a traditional point of view is wrong. As will be pointed out later in this chapter, traditional leadership skills and behaviour are also necessary in a Complexity Approach. It can however be argued that a traditional approach alone (or as *the main* approach of leadership) is of less relevance than a Complexity Approach in responding adequately to complexity.

With the principles of reductionism, determinism, objectivity and rationalism in mind, let us now move on to the discussion of a Complexity Approach to leadership.

4.2 A Complexity Approach to Leadership

A Complexity Approach and the implications of this approximation for leadership is a relatively new field of research within the Social Sciences. A Complexity Approach to leadership can be studied using different methodologies, for instance using techniques such as agent-based modelling or swallowtail catastrophe modelling grounded in computer

simulations of complex systems (Hazy, 2007; Guastello, 2007), or more qualitative methodologies which would be more representative for the approach chosen in this dissertation.

Before continuing let us stop for a moment and remind ourselves that complexity does not refer to something complicated, as would be representative for something inorganic and materialistic, but represents rather the *rich interconnectedness and dynamic interaction* between agents and the environment[6] (Uhl-Bien & Marion, 2009: 632).

The previous chapter elaborated on the interconnected and mutually dependent system conditions for emergence[7], namely self-organization, disequilibrium (non-linearity and chaos) and positive- and negative feedback. One of the most important task of a Complexity Approach to leadership is thus to support these system conditions for emergence.

This part of the chapter seeks to investigate and support a view where leadership *not only* is the incremental influence by one person over other persons, but also interpreted as a collective social phenomenon (Osborn, 2002: 798). From this it follows that leadership might be better described by the *dynamics of emergence*, rather than particular directives imposed by formal organizational managers (Lichtenstein & Plowman, 2009: 618).

The dynamics of emergence requires the complexity oriented leader to be an *enabler* that finds the balance between what structures and behaviour that provide *freedom and constraints* (Cilliers, 2010: 16) , which simultaneously facilitates enabling boundaries and "bounded" adaptive capacity. The freedom and constraints must not merely be thought of the relative impact of procedures or rule based regimes, but with increasingly communicational, behavioural and functional aspects substantiating a *richly constrained play of difference by a rich identity* (Cilliers, 2010: 14)[8].

This dissertation will organize the discussion around three limitless interconnected approaches as illustrated in figure 11. The figure serves as an illustration of the interconnected nature of a Complexity Approach to leadership where mutual dependencies and unpredictability are highlighted. The discussion will be initiated by highlighting the unpredictability and limitless context of leadership. Different leadership roles will then be elaborated upon focusing on the organization which consists of both informal and formal aspects that together develop into emergent behaviour. Then different leadership behaviours

[6] The distinction between what is simple, complicated and complex is discussed in the previous chapter.
[7] Necessary conditions, but not automatically sufficient conditions to create emergence (Lichtenstein & Plowman, 2009: 626)
[8] Please see part four of chapter 3 for further discussion on this topic.

that support emergence will be discussed before finally presenting an empirical example of a Complexity Approach to leadership.

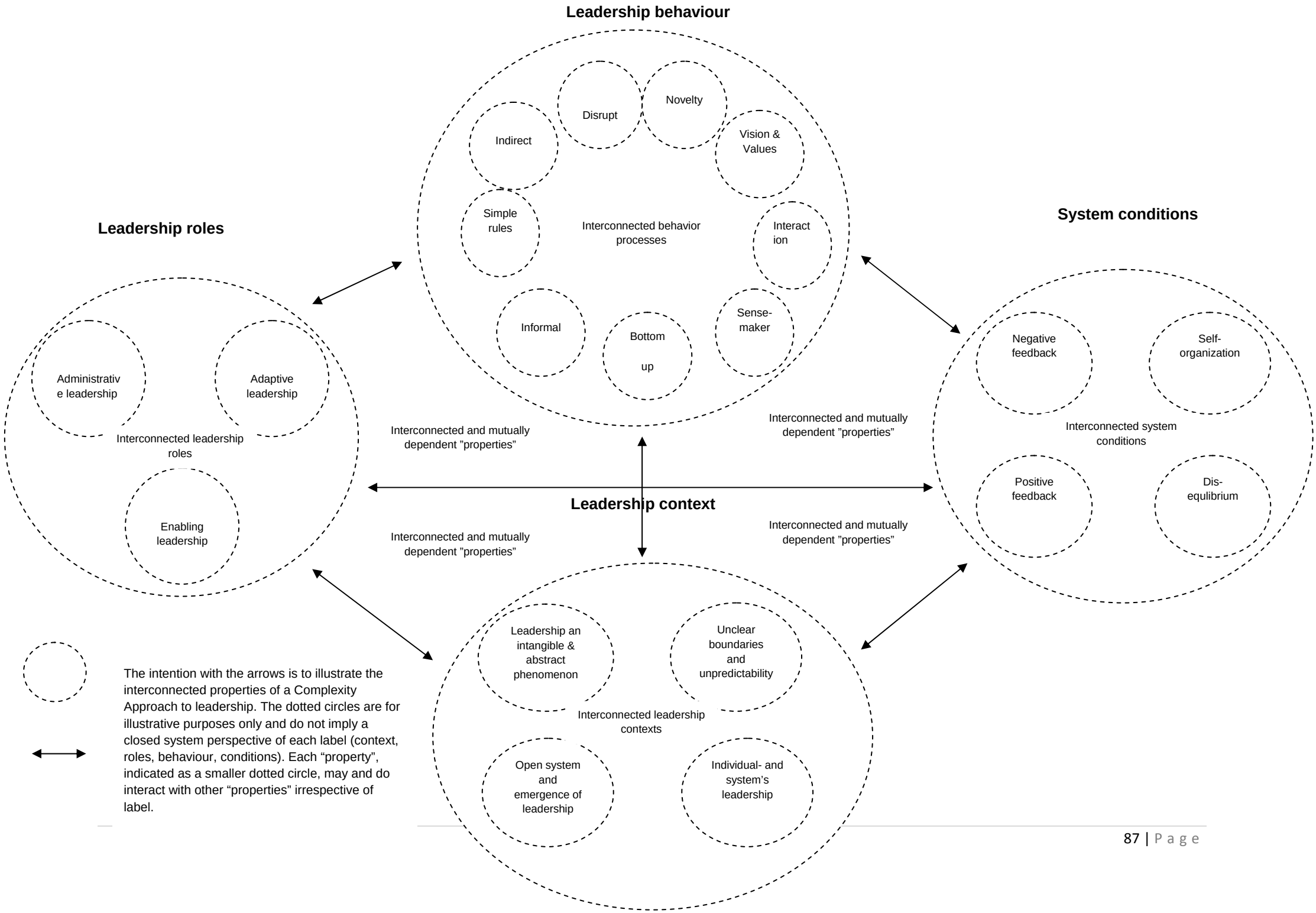

Leadership behaviour
Disrupt
Novelty
Indirect
Vision & Values
Simple rules
Interconnected behavior processes
Interact ion
Informal
Bottom up
Sense-maker
Leadership roles
Administrativ e leadership
Adaptive leadership
Interconnected leadership roles
Enabling leadership
System conditions
Negative feedback
Self-organization
Interconnected system conditions
Positive feedback
Dis-equlibrium
Interconnected and mutually dependent ”properties”
Interconnected and mutually dependent ”properties”
Leadership context
Interconnected and mutually dependent ”properties”
Interconnected and mutually dependent ”properties”
Leadership an intangible & abstract phenomenon
Unclear boundaries and unpredictability
Interconnected leadership contexts
Open system and emergence of leadership
Individual- and system’s leadership
The intention with the arrows is to illustrate the interconnected properties of a Complexity Approach to leadership. The dotted circles are for illustrative purposes only and do not imply a closed system perspective of each label (context, roles, behaviour, conditions). Each “property”, indicated as a smaller dotted circle, may and do interact with other “properties” irrespective of label.

Figure 11 - A Complexity Approach to Leadership

4.2.1 The Context

Traditionally, using the word 'context' may be understood as referring to specific frameworks within which something takes place (Microsoft Encarta (9)). For instance, one might use organizations or specific technologies as a context to explain certain phenomena.

In a complexity setting, however, less emphasis is put on pre-defined and "fixed" contexts, which for instance a certain technology might provide, instead is looked upon as *"unplanned and uncontrollable mechanisms that emerge naturally among interactive, adaptive agent acting in situations"* (Uhl-Bien & Marion, 2009: 637). A context is thus not given, but instead the context emerges as a result of interaction.

With this perspective on "context" in mind let us now turn over to some proposals for the environment in which a Complexity Approach to leadership takes place.

Proposition 1.1: Leadership is intangible, abstract and interconnected

An essential and all-embracing aspect to discuss is the notion of *reality*. As previously mentioned, a Newtonian Approach to reality is based on objectivity, rationalism, reductionism and determinism (Strand, 2007: 198). The context in a Newtonian perspective is thus isolated, static and interaction between the observer and the observed object is of little relevance (Fernandez et al, 2007: 173; Juarrero, 2007: 110).

A Complexity Approach, on the other hand, argues that reality is a result of the interaction between both non-material and material forces that co-create the present (Wheatley, 1999: 50-52). Something cannot exist in isolation while in reality it is intangible, dynamic and interconnected (Cloete, 2006: 468).

The same dynamic is relevant for leadership (both individual and collective). While leadership from a traditional point of view has been interpreted as something objective and tangible (Taylor, 2005: 141), a Complexity Approach to leadership is a result of co-existence between *interacting* agents, whether it is looked upon as a process of individual intentional influence or a collective process. Although leadership can be perceived as something abstract and intangible, the results of these processes might be tangible and concrete, for instance a concrete leadership behaviour or an increased production rate. Hence, the

underlying processes of leadership are intangible, abstract and interconnected, while the *de facto* execution of leadership will have tangible and concrete aspects.

Stating that intangible, abstract and matters of co-existence are equally or more relevant than tangible, concrete and objective matters, necessarily means that a qualitative methodology might be more relevant compared to a quantitative approach (Fairholm, 2004: 375-380). Unless the quantitative model is as complex as the complex system itself, which is impossible, the picture produced is not accurate (Cilliers, 1999: 24). The principle of incompressibility can only by covered by a qualitative framework which allows emergence, non-linearity and constant evolvement (Roodt, 2007: 218).

The view presented in this proposition is also representative for the next proposition, namely the inherently fuzzy boundaries and unpredictability of the environment in which complex leaders operate.

Proposition 1.2: The context is unpredictable with unclear boundaries

In a decomposable system the whole is separated into its isolated parts (Cilliers, 2005: 138), that is, the boundaries of the system are clearly defined as for instance functions, areas of responsibility and departments. These boundaries are often defined, mostly through formal processes, with the belief that it will optimize the organization and create “order” and stability.

Keeping in mind the discussion in the latter chapter around simple, complicated and complex systems, it becomes evident that a clear definition of boundaries is only possible in a simple or complicated system. If a system has clear and concise boundaries, it would be relatively easy to comprehend, as it would be decomposable (Cilliers, 2005: 138). A complex system being an open and dynamic system makes it impossible to clearly define its boundaries as it is in constant flux. The artificially made boundaries are thus often highly unrealistic and may be considered to be counterproductive as every organization *de facto* has fuzzy boundaries internally and externally (Uhl-Bien & Marion, 2009: 633).

The creation of these artificial boundaries is often an automatic response to complex challenges, as the belief from a traditional point of view is based on the notion that complex problems often necessitates complex solutions. The result from the generation of more coordination, direction and planning may, however, produce an organization so rigid that it is unable to react adequately to its environment (Edvardsen, 2000: 273).

The unpredictability and unclear boundaries of any given organization has been extensively highlighted by the emergence of an intricate and interconnected technological, social and global environment (Osborn & Hunt, 2007: 327). This global trend is often referred to as globalization, something which has had consequences for every aspect of the Social Sciences. Thomas L. Friedman argues that the world has become flatter due to *inter alia* the emergence of virtual communities, outsourcing, digitalization and information availability (Friedman, 2005: 93, 126, 151, 176 & 186). Due to globalization a rise in complex challenges are evident for almost all organizations. The constant need for innovation and reinvention, shifting competition base and mergers and acquisitions are some of the aspects contributing to the rise in complex challenges (Martin, 2007: 7).

The intangible aspects and fuzzy logic of complex environments raise a number of fundamental questions concerning our traditional perception of leadership. One of these questions is the perception of leadership merely being something embedded in individuals, something the next proposal will discuss.

Proposition 1.3: A Complexity Approach to leadership has both individual – and systemic perspectives

When discussing a Complexity Approach to leadership it might be fruitful to distinguish between what leadership an individual agent exhibits and what leadership the whole system displays. An important aspect to highlight in the relationship between these two interconnected mechanisms is that individual agents act with *intention*, while the leadership that emerges through the system as a whole is acting without intention and often with surprising results.

From an individual – and perhaps more traditional point of view, there are a number of leadership behaviours an individual agent may exhibit to support the emergence. This aspect will be further elaborated on under “leadership behaviour”.

The other perspective – and indeed more antagonistic to a traditional approach, is the view of leadership as something collective. Burns (2002: 48) emphasizes that all agents in a complex system carry out leadership through their interaction with the environment (whether it is internal or external). Leadership is thus a metaphor of the collective behaviour of the system which emerge through local interaction, not the behaviour of single agents (Uhl-Bien, Marion & McKelvey, 2007: 306-307; Stacey, 2005: 106; Taylor, 2005: 148; Marion & Uhl-Bien, 2004: 29; Walker, 2006: 108).

Leadership from this perceptive is interpreted as a decentralized process, not a centralized process. The dispersion of leadership, and hence control, to all parts of the system evidently creates stronger resilience and subsequently stronger control (Cilliers, 1998: 110). From a traditional point of view, however, the decentralization may be interpreted as a loss of control.

The principles elaborated on in this proposal might provide the impression that leaders and managers are irrelevant as there is little one can do to alter the development (Dubrin, 2007: 10). A more important question one might ask, however, is how the leaders and managers should change their *modus operandi* to become more relevant. The next proposal discusses one of the fundamental changes transforming to a Complexity Approach of leadership.

Proposition 1.4: The *role* and *work* of a complex leader arises as a result of an emerging process based on a dynamic interaction between human beings and the environment

The core of a Complexity Approach to leadership is related to the social process of dynamic and constant interaction between human beings and the environment (Griffin, 2005: 29). The key word for understanding the difference between a Traditional and Complexity Approach is *interaction*. A traditional approach to leadership is often based on mechanistic and technical perspectives, for instance creating adequate technical systems to support effectiveness and efficiency. Traditional leaders are thought to stand outside of the processes and act as objective observers of events.

In a Complexity Approach to leadership the role and work of a leader is based on an emerging and bottom-up process of local interaction between agents (Simpson, 2006: 479). In other words, the *participation* in the dynamic and continues process of human relating (Walker, 2006: 108) is far more important than creating blueprints or procedures to achieve specifically defined objectives (Stacey & Griffin, 2005: 106, 116-117, 121-122). The role of the leader has less to do with the formalized power often related to Newtonian organizations, but instead the leader and the role of the leader emerge as a result of social acknowledgement (Stacey, 2005: 10; Tobin, 2005: 86-87; Taylor, 2005: 141). As such, the tool kit of an emerged leader is somewhat different from a traditional leader's tool kit, by merit of the fact that the intention with the leadership is different. While traditional and formal leaders often impose leadership based on a top-down approach, a complex leader rarely uses authoritarian mechanisms, but instead supports the indirect and catalytic processes within the organization (Schneider & Somers, 2006: 357; Burns, 2002: 49; Simpson, 2006: 479; Fairholm, 2004: 375-380; Cole, 2007: 229).

However, in light of all informality and emergence, one must also acknowledge that organizations have and also is in need of formal structures and formal leaders (obviously more in a bureaucratic model than in a networked structure). In fact, a complex leader will in a number of situations also need to possess certain skills or behaviour often related to a traditional approach, something which will be discussed below. It is also important to point out that there is nothing standing in the way of formally appointed leaders being complex leaders.

Having discussed the general context of a Complexity Approach brings this dissertation to the discussion around leadership roles from a complexity perspective.

4.2.2 Leadership Roles

According to Dubrin (2007:11) a leadership role can be described as "*an expected set of activities or behaviours stemming from one's job"*. Microsoft Encarta (2008 (10)) links a role to a particular function, more specifically stating a role being *"the usual or expected function of somebody or something, or the part somebody or something plays in an action or event".* The latter definition states that a role is not necessarily tied up in a person, but may be linked to something else, for instance an organization or a system.

This dissertation will organize the following discussion around three main leadership roles in a Complexity Approach to leadership: enabling leadership, administrative leadership and adaptive leadership. These leadership roles might be interpreted both from an individual- and system's perspective and may be linked to both the formal and informal parts of organizational dynamics.

The latter statement highlights an important fact: An organization consists of both formal and informal parts and a complex leader must acknowledge both aspects, something the establishment of the enabling-, administrative-, and adaptive leadership role recognizes.

Proposition 2.1: Complex leaders act in enabling leadership

In a traditional approach to leadership a leader often tends to rely upon formalizations, routines and a diverse set of control mechanisms. In a Complexity Approach to leadership however the emphasis is on the leader as an enabler for the self-organizational processes of the organization (Schneider & Somers, 2006: 356; Plowman et al, 2007: 344; Osborn & Hunt, 2007: 322).

In the *interconnected* relationship between the enabling-, administrative-, and adaptive leadership roles, the enabling leadership serves as the *entanglement* of the administrative- and the adaptive function (Uhl-Bien et al, 2007: 299, 305-308, 314). In other words, the enabling function balances the roles in order to facilitate complex behaviour. For instance, in a highly rigid bureaucracy, the administrative role will most likely stifle the adaptive role and thus the potential for innovation and creativity. On the other hand, in a highly loosely networked structure the adaptive role might be well-developed, but the administrative role, and thus the potential for implementing and integrating the creativity and innovation into the organization, is suppressed.

Put differently, enabling leadership balances positive feedback (adaptive leadership) and negative feedback (administrative leadership). Too much positive feedback might push the system into random chaos (anarchy), but too much negative feedback might push the system into equilibrium (death). The system functions at its best when operating at the "edge of chaos" as at this point it facilitates creativity, innovation and transformation, but still relies on an underlying order.

Depending on the situation, enabling leadership must thus exhibit behaviour that both enforce the adaptive function and the administrative function. For instance, in order to enable "balance" one can directly or indirectly affect the number of agents in a given system, their inter-connectedness and inter-relatedness with the internal- and external environment and foster tension (McKelvey, 2008: 3; Schneider & Somers, 2006: 358; Uhl-Bien et al, 2007: 309, 310 & 311).

This dissertation will now turn over to the discussion around complex leaders exhibiting administrative leadership.

Proposition 2.2: Complex leaders act in administrative leadership

The latter section proposed that the level of administrative leadership needed in an organization will depend on a number of factors, for instance the kind of organizational structure and organizational size. The reality of today's environment is that bureaucratic principles of organization are the most preferred form of structuring (Uhl-Bien & Marion, 2009: 632).

As pointed out at the start of "A Complexity Approach to Leadership" stabilizing feedback, or what it is more commonly referred to as negative feedback, is one of the four system conditions for emergent order. For organizations, and perhaps in this context bureaucratic organizations in particular, to benefit from the outcomes produced by adaptive leadership

(e.g. creativity, novelty, innovation), the organization must integrate the emergent outcomes into the organization (Uhl-Bien & Marion, 2009: 633).

Hence, administrative leadership links the informal part of the organization to the formal part of the organization by implementing the emergent outcomes materialized as for instance a product or a service into the formal structure.

The purpose of administrative leadership is thus primarily linked to support negative feedback mechanisms, although one can also argue for the opposite. For instance, some of the purpose of administrative leadership is to establish systems, develop policies and implement structures that facilitate a rich flow of information and resources throughout all organizational levels (Uhl-Bien & Marion, 2009: 644). On the one hand this might be interpreted as negative feedback mechanisms because administrative leadership "shapes" attractors or uses "local" vision to unify and stabilize. On the other hand, and of course depending on the content of the policies and structures, this might be looked upon as positive feedback as it facilitates self-organizational behaviour.

In the debate between a Traditional and Complexity Approach, administrative leadership has a number of similarities with a traditional approach to leadership. The use of attractors such as objectives and policies, and the focus on formal structures, indicates a support of a top-down driven and relatively authoritarian leadership approach (Uhl-Bien, Marion and McKelvey: 2007).

During the discussion around leadership roles this dissertation has on a number of occasions mentioned adaptive leadership, something the next section will elaborate on.

Proposition 2.3: Complex leaders act in adaptive leadership

A prerequisite for system adaptation is that the system be out of balance. A system can move from being in equilibrium to operating far-from-equilibrium through positive feedback loops. As discussed earlier, negative feedback is stabilizing while positive feedback is destabilizing, reinforcing and amplifying (Parker & Stacey, 1997: 25-26).

Adaptive leadership refers to *"adaptive, creative and learning actions that emerge from the interactions of CAS* [complex adaptive systems] *as they strive to adjust to tension"* (Uhl-Bien, Russ and McKelvey: 2007: 305-308).

Adaptive leadership is not a result of formal processes within an organization, but symbolizes the informal leadership processes that manifest itself in the interaction between interdependent individual or collective agents (Uhl-Bien & Marion, 2009: 638). What might be

noteworthy to highlight is that adaptive leadership is not aimless and based on random behaviour. Agents engage in interaction *with the intention* of producing something, where that something is adaptation. The outcome of the collective behaviour of the system is, however, emergent and seemingly spontaneous. This sensation of spontaneity is based on the fact that a non-linear dynamics is difficult to trace to causal and initial variables. An adaptation or change in general is thus not generated from "zero", but rather by sudden changes in interactive dynamics (Uhl-Bien & Marion, 2009: 637).

In comparison to the often "hard", tangible and rational mechanisms of traditional leadership, adaptive leadership is more about facilitating the informal and creative processes in order to respond to adaptive tension. This will be further elaborated upon in the following section.

The interconnected relationship between the different leadership roles will now be highlighted.

4.2.2.1 The interconnected nature of enabling-, administrative - and adaptive leadership

It is the dynamic and interrelated *relationship between* the enabling-, administrative-, and adaptive leadership approaches which evidently leads to emergent behaviour and hopefully a positive outcome. A sole focus on isolated leadership roles will make either of them evidently become counterproductive because it is the *pattern* the whole produces over time which is interesting, not necessarily the specific capacity of each role. A too high degree of adaptive leadership might result in "complexity catastrophe", because there are too many connections and interactions (McKelvey, 2008: 3), while an authoritarian and control-based approach will have the opposite effect (Uhl-Bien et al, 2007: 306).

The entanglement between the formal top-down administrative forces and the informal adaptive forces is thus of paramount importance in the quest for nurturing healthy adaptive organizations (Uhl-Bien & Marion, 2009: 633).

In this section of the chapter we have discussed the context and leadership roles of a Complexity Approach to leadership. Emphasis has been put on a description of the context as being highly unpredictable, intangible and with the absence of clear boundaries. The interconnected leadership roles of enabling-, administrative-, and adaptive leadership have been discussed with due recognition of the entanglement of formal- and informal processes in the emergent behaviour of organizations.

Bearing the context and leadership roles in mind, the next section will discuss the kind of leadership behaviour necessary in order to support emergence.

4.2.3 Leadership Behaviour

Microsoft Encarta defines "behaviour" as a psychological response which manifests itself in *"the way in which a person, organism, or group responds to a specific set of conditions"* (Microsoft Encarta (11)). In a leadership context then, leadership behaviour is connected to what actions the individual leader or the system of leadership executes.

In a complexity setting the main purpose of leadership behaviour is to support emergence. The following propositions describe a number of interconnected and mutually dependent behaviours that will support disequilibrium, self-organization and positive and negative feedback.

Proposition 3.1: Complex leaders disrupts existing patterns

Traditional leadership behaviour is often aimed at creating balance and stability in the organization through miscellaneous control functions and deterministic planning processes. Although this may also be necessary from a complexity point of view (negative feedback and short term planning), a Complexity Approach puts emphasis on the leader's responsibility to disrupt the existing patterns of the organization with the purpose of destabilizing the system.

One might distinguish between disrupting existing patterns from an individual- and organizational perspective while simultaneously having in mind the degree of disruption which is exerted. The degree of disruption forms our point of departure. In some situations where the system is already operating far-from-equilibrium, too much disruption might push the system into random chaos. Taking into consideration how small changes in initial conditions might spark big changes through non-linear dynamics also emphasizes the fact that *the degree or amount* of disruption is not necessarily relevant.

From an individual perspective, hiring new personnel or acquiring new knowledge by sending employees on courses might be a way of disrupting existing patterns, while from a system's perspective the implementation of new systems or new doctrines might serve the same purpose.

There are, however, two main leadership behaviours that support destabilization, namely *creating and surfacing conflict and embracing uncertainty* (Plowman et al, 2007: 344; Parellada, 2007: 166; McKelvey, 2008: 3; Uhl-Bien et al, 2007: 311; Uys, 2002 41; Kiel, 1994: 204-205; Walker, 2006: 102-103; Parker & Stacey, 1997: 34, 64).

By highlighting conflict and differences, compared to highlighting harmony and homogenous thinking, the system tends to be in a disequilibrium state where conditions for novelty and innovation are flourishing. Uhl-Bien and Marion (2009: 643, 645) refer to this as creating *adaptive tension*, i.e. creating an incentive for the system to change. Without an incentive to change, for instance no attractors (strange or not), the system tends to stay in known territory which in turn fosters equilibrium.

Embracing uncertainty is equally important leadership behaviour and stresses the importance of acting into the unknown deliberately and taking action although the situation is perceived to be fuzzy and unclear. Deciding and acting on intuition naturally results in a higher level of risk which is a strong contradiction to traditional leadership behaviour with its reliance on rationalism, objectivity and determinism.

Although disrupting existing patterns yields a positive outcome as concerns the emergence of novel and creative behaviour, there are also some negative associations linked to conflict and uncertainty. Adaptive tension may inevitably be accompanied by a feeling of uncertainty, discomfort and anxiety among the organization's members, which might be counterproductive for the organization as a whole. In a complexity setting then, leadership must support the organization's ability to live with the stress the uncertainty that disruption causes.

One of the actions leadership might consider in support of the emergent processes of the organization is to lead by a set of simple rules instead of incorporating a detailed control regime. The next section will discuss the use of simple rules as a way of integrating local constraints.

Proposition 3.2: Complex leaders lead by simple rules

From a technical point of view one could argue that the use of simple rules is part of the administrative leadership role where negative feedback is imposed to balance the effects of positive feedback. On the other hand one can argue that simple rules catalyze and facilitate bottom-up processes and thus enable adaptive leadership.

In a traditional leadership context the means of leading might be connected to the use of detailed instructions and regulations such as doctrines or policies to reach a specific objective. Doctrines and policies are not necessarily irrelevant in a complexity setting, the content, however, is based on different principles. For further discussion on this topic the reader is referred to chapter 5 and the propositions of a Complexity Approach in Military Organizations.

The purpose of using a set of simple rules instead of imposing a detailed control regime is twofold. First and foremost, the articulation of simple rules creates more freedom of maneuver and flexibility for the agents in the system, something which nourishes the self-organizational processes. Secondly, simple rules offer some guidance or boundaries for the agents to work within (something which might be considered as both positive and negative depending on the situation). The integration of local constraints (Lichtenstein & Plowman, 2009: 625) can also be referred to as "strange attractor cages" (McKelvey, 2008: 3) where the emergence of broad objectives or vision may serve as adaptive tension and thus disrupt existing patterns. The cage is thus a symbol of the space where one has the freedom to operate and a vision might serve as adaptive tension for the creation of an incentive for change.

Wheatley (1999: 129) argues that simple rules are the expression of purpose, intent and values. From this it follows that "boundaries" or "cages" do not necessarily need to be formulated as rules or regulations, i.e. something tangible or measurable, but may be expressed as something intangible and qualitative, for instance a set of values or desired organizational culture (Plowman et al, 2007: 347; Johnson, 2001: 226). The expression of simple rules rests thus primarily on the emergence of process incentives, not content directives (McKelvey, 2008: 3). In many ways then, in order to lead better, one should in fact do less.

The use of simple rules is also closely connected to what is described as *swarm logic* in chapter 3. The swarm behaviour of a system (a phrase often connected to social collective insects such as those exhibited by ants or termites) is a metaphor for the collective intelligence that emerges through local interaction between agents. One might, from a complexity point of view, consider one agent's over all capability as relatively limited (whether that agent is an ant or a human being), but the collective intelligence which emerges through local interaction might accomplish astonishing achievements far exceeding the capability of a single agent.

The disruption of an organization's patterns and the emphasis on simple expressions of purpose, intent and values will most likely generate more questions than answers, something which highlights the need for individual- and collective sense-making. The next section will discuss the role of leadership as "tags" and sense-makers.

Proposition 3.3: Complex leaders act as sense-makers

The purpose of sense-making is not that the leader should provide definite answers, but instead *assist and engage* in an ongoing emergent process of meaning and interactions as the organizations move through unknown territory (Shiel, 2005: 182-183).

In a Complexity Approach to leadership the emphasis is thus on the *interpretation* of emerging events, not the creation of prescribed events. Leaders then become *catalysts*, rather than architects for change through participation in collective sense-making in the organizational context (Taylor, 2005:149; Schneider & Somers, 2006: 356; Griffin & Stacey, 2005: 10, 25-26).

Leadership may support the sense-making processes by accepting the role as a "tag". A tag can be described as a direction setter of what behaviour is valued by identifying and emphasizing what is important (Lichtenstein et al, 2009: 625). A leader may be identified as a tag when other agents use the leader as a symbolic reference of a message trying to be distributed through the system (Plowman et al, 2007: 352).

Boal and Schultz (2007: 415) use General Douglas MacArthur as an example of a tag where his words "duty, honor and country" serve as a powerful reference signal to guide the behaviour of US military officers. The fact that General MacArthur's words date back to 1962 also illustrates that a tag does not necessarily need to be "new" in terms of time. Hitler, for instance, still serves as a strong tag for specific behaviour, despite his death six decades ago (this also demonstrates that a tag can be characterized as both good and bad).

A tag does not need to be related to strategic leaders, as have been illustrated so far. Leaders on lower levels (and similarly, even those who are not considered as leaders as such) might emerge as an equally, or even more powerful, frame of reference than any strategic leader. Last, but equally important, a tag does not need to be related to a human being, but may be identified as something inorganic and immaterial, for instance a shared vision.

Another aspect which supports the process of sense-making is to create *correlation* through the use of language and symbols (Lichtenstein et al, 2009: 624-625). By means of specific language or symbols meaning can emerge in the understanding of unfolding events. For instance, during the 2008 US Presidential Election Campaign Presidential candidate Barrack Obama strongly emphasized using rhetoric symbolizing change, reconciliation, peace etc. The Venezuela President Hugo Chavez's continuous characterization of the United States as

"el Diablo" or likewise former President George W. Bush's use of "axes of evil" both serve as strong symbols trying to support (or manipulate) sense-making among the population.

A means of supporting correlation is the use of *story-telling,* purposively linking the past of the organization with the present and supporting a common understanding of why things are the way they are. Stated differently one could say that story telling by human "tags" serve as a catalyst for the emergence of the participants' perspectives (both individual and collective) (Boal & Schultz, 2007: 423). From a technical point of view, storytelling may be referred to as a reference signal (in positive or negative feedback loops) that guides the adaptation of the system (Boal & Schultz, 2007: 419-420).

A Complexity Approach to leadership has so far highlighted principles such as participation, collective sense-making, flexibility and meaningful interaction. From this it follows that an indirect approach to leadership in most cases is more relevant in a complexity setting than a traditional direct approach to leadership. The next section will discuss the relevance of an indirect approach to leadership in a complexity setting.

Proposition 3.4: Complex leaders favour an indirect approach to leadership

A traditional leadership approach is often connected to a direct approach where the leader is in the centre of events, either doing, directing or creating. As noted in the latter paragraph, a Complexity Approach to leadership emphasizes rather an indirect approach to leadership where the leadership focuses on *making things possible* instead of *making it happen*. Thus, a leader should emphasize facilitation and encourage emergence and self-organizational processes instead of directing behaviour in a top-down way (Plowman et al, 2007: 354; Keene, 2000: 16-18; Karp & Helgø, 2007: 35; Fairholm, 2004: 375-380; Parker & Stacey, 1997: 65; Johnson, 2001: 226; Parellada, 2007:16; Wheatley, 1999:161; Martin, 2007: 7).

This does not mean, however, that a direct approach to leadership is never necessary in complex systems. This aspect will be further discussed in the context of strategic leadership versus lower level leadership[9] in chapter 8, "A Meta-Competency Model for leadership in Complex Military Systems".

An indirect approach to leadership is closely connected to the support of bottom-up processes something the next section will elaborate on.

[9] From a military perspective

Proposition 3.5: Complex leaders support bottom-up processes

Choosing a Complexity Approach to leadership is based on the acknowledgement that organizational behaviour is best facilitated through concepts which involve employee participation, not through top down imposed control mechanisms that inhibit freedom of action (Simpson, 2006: 479; Martin, 2007: 6; Wheatley, 1999: 131).

The belief that small changes in initial conditions may grow to emerge as big changes through non-linear dynamics supports the notion that freedom of action must be present on as low an aggregation level as possible (Baets, 2007: 108). From this it follows that tolerance for uncertainty, risk-taking and empowerment of the employees are crucial elements in a Complexity Approach to leadership (Burns, 2002: 49-50; Kiel, 1994: 204-205).

What is not clear, however, is the importance of the degree to which the *initiation* of emergent behaviour is a result of a bottom-up or a top-down process. For instance, could one argue that bottom-up processes can be supported positively by a top-down process of facilitation[10] or does the initiation solely need to be grounded in a bottom-up process? Osborn and Hunt (2007: 323) argue that the combination of bottom-up structure and top-down hierarchy is necessary, particularly in large-scale economic organizations. This view is further supported by a perception that a complexity oriented leader must balance between freedom and constraints (Cilliers, 2010: 16).

A bottom-up process can be considered to be an emergent, dynamic and highly informal process in contradiction to the prefixed, static and formal processes. The next proposition states that complex leaders value the informal processes in an organization.

Proposition 3.6: Complex leaders value the informal processes in an organization

The description of the different leadership roles (enabling, administrative and adaptive) highlight that an organization consists of both formal and informal parts. While a traditional approach to leadership will often highlight the formal and visible processes of an organization, a Complexity Approach *in addition* and perhaps to a higher degree, values the informal processes.

[10] That is, the leader being in a different hierarchical and power relation support the emergent bottom-up process through leadership behaviour such as simple rules, disruption etc.

Dialog and continuous dynamic awareness in the everyday interaction of the organization are important keys for discovering individual and shared *meaning* in the organization (Taylor, 2005: 132-133, 148-149; Shiel, 2005: 182-183; Wheatley, 1999: 148-149). The shared meaning emerges (and constantly changes) as agents interact deliberately into the unknown. Shaw (2002) argues that the "medium" of interaction is conversation and that in order to facilitate spontaneity, individual and collective sense making and innovation organizations must change their patterns of conversation. Boal and Schultz (2007: 417) also support the importance of dialogue:

"A great deal of dialogue, collaboration, and exchange is frequently necessary in order to generate sense making and meaning, and thus the learning effects desired within an organization. Dialogue aids in surfacing one's own and other's thoughts and assumptions, helps create new ideas, and initiates collective action".

Shaw (2002) claims that organizations should acknowledge the importance of, and consequently prioritize informal conversational processes. A formal conversational process, for instance a business meeting, often has clearly defined borders in terms of a clear agenda and participants, to use an example. An informal conversational process on the other hand is the everyday dialogue where the agenda and participants are not clearly defined. For instance, the lunch breaks "where all the real work gets done" serves as a suitable example of an informal meeting place where dialogue and conversational topics emerge irrespective of pre-defined functions or hierarchical positions. From this it follows that informal processes will most likely nurture heterogeneous- and diverse participation and thinking to a larger extent than formal processes, something which serves as a system's condition for emergence (disequilibrium).

Jack Wells, the previous CEO of General Electric, refers to the importance of heterogeneous agents in the emergence of a boundaryless learning culture. By gathering people of all ranks and functions to focus on a specific issue or opportunity, creative and innovative ideas are likely to emerge (Abernathy, 1999: 41).

An important part of a Complexity Approach to leadership is thus facilitating dialogue across artificial hierarchical and functional boundaries and recognizing the importance of informal conversational processes as an important source of fuel for innovation and novelty.

The facilitation of conversational processes in the organization is an essential step towards initiating the organizational capability of creativity and innovation. There are, however, a number of other actions leadership can take to support these emergent processes. The next proposition discusses the importance of leadership which encourages novelty.

Proposition 3.7: Complex leaders encourage novelty

A continuing challenge for leaders in complex systems is, on the one hand to avoid stagnation and stability and on the other hand to adapt to the changing environment (Burns, 2002: 56). An important pillar for avoiding equilibrium is to constantly rethink and re-evaluate current assumptions, where a leader's ability to support these processes of novelty is considered crucial.

The critical assessment of current methodology and the encouragement of novelty are referred to by Kiel (1994: 175) as a non-linear method of leadership. One the one hand Kiel argues, are the rationalists who symbolize a traditional approach to leadership, and on the other the risk takers who explore new and unknown territory representing a Complexity Approach.

The strife for novelty is supported by the ability of this kind of leadership to allow experiments and tolerate fluctuations in the organization (Lichtenstein et al, 2009: 622). As discussed previously fluctuations are considered to be positive in a complexity setting as the system moves away from equilibrium and experiments might be a way to support the emergence of these fluctuations. Allowing experiments also necessarily implies bigger risks involved (with potentially negative and positive outcomes) and that agents must be encouraged to think "outside the box".

A second aspect of supporting novelty, which has also been the core of a number of other propositions so far, is to encourage rich interaction. Interaction between agents (especially a heterogeneous composition) can potentially lead to unexpected and new solutions to existing challenges. A culture of rich interaction reinforces the interpersonal networks based on a *"shared context of mutual respect, trust and psychological safety in the relationship"* (Lichtenstein et al, 2009: 623). A fine balance is however required to avoid "tied" networks which evidently foster homogenous thinking (McKelvey, 2008: 3).

The last aspect in this proposition is that novelty is more likely to occur if leadership supports collective action (Lichtenstein et al, 2009: 623-624). As noted in the proposition that complex leaders lead by simple rules, the capacity of the collective far exceeds an individual's capacity. The swarm behaviours of a collective that emerge through local interaction between interdependent agents thus have a greater potential for unexpected and novel outcomes than a single individual's actions.

The word "facilitation" has been used in a number of propositions so far and a number of ways to implement this facilitation has been highlighted. The next proposal discusses how

the use of vision and values may facilitate a strong reference signal in the emergence of individual and systemic behaviour.

Proposition 3.8: A Complexity Approach to leadership substantiates the importance of vision and values as core elements of an emergent system's reference signal

Let us start to clarify what is mean by values and vision.

Microsoft Encarta defines values as "*the accepted principles or standards by a person or a group*" (Microsoft Encarta (12)). Stacey and Griffin (2005: 7) state that values are the basic reference signal in an individual's preferred choice over another and that values emerge in the social processes of interaction.

Microsoft Encarta defines vision in a number ways, for instance a mental picture or the ability to anticipate future events (Microsoft Encarta (13)). Senge (1990) postulates that vision gives direction to an organization in terms of what to do in order to create the desired future.

Although incremental change through fixed procedures and rules are still an important direction setter in a traditional approach to leadership, the articulation of a vision and values, and the mobilization of support around them is considered to be an important feature of contemporary leadership. The crucial difference between a traditional- and a Complexity Approach is however in the establishment of these vision and values.

An individual's articulation of vision and values and execution of specific measurements to rally support for these enunciations illustrates a strong Newtonian picture i.e. that the process can be controlled, pushed or steered in a specific direction based on top-down mechanisms (Stacey & Griffin, 2005: 116).

A Complexity Approach to vision and values relies on an *evolutionary* process where vision and values emerges *within* the organization (Osborn & Hunt, 2007: 329, 332), not through a process of direct influence from specific individuals in order to obtain a specific objective. One could thus state that leadership is less interventionist and more value centered (Dilworth, 1998: 497) interpreting leadership as a *participant* in the emergent and bottom-up process of vision- and value development (Stacey & Griffin, 2005: 106, 116-117, 121-122). A semantic note is required; complex leadership may influence its environment in the way that it acts deliberately in everyday interaction, but has no influence in the manner of *imposing* a specific set of values or vision. Burns (2002) links leadership to the emergence of values

stating that the purpose of leadership in a complex system is primarily to "*inspire agents to revisit the ultimate purpose and core values of the system*", which together with the focus on the environment allows the organization to lift its collective vision from the everyday and short term hassles to its essential purpose (Burns, 2002: 48-49; Keene, 2002: 16-18).

From a complexity point of view vision and values are thus not an expression of a desired objective, but rather symbols of the emergent processes (Wheatley, 1999: 55-58). It emphasizes the fact that vision and values are considered to be something immaterial and intangible, but may be materialized and visualized in the patterns the system produces, for instance in the way people behave. Another aspect to consider in the use of desired objectives is that the alignment around one single vision or goal (formulated as a desired objective) may foster homogenous thinking- and action, which may inhibit creativity and innovation. The *interdependence* which develops between interacting agents in the emergent process of vision and value making is thus considered to be a more powerful source of change than alignment around one single vision or objective (Uhl-Bien & Marion, 2009: 642)

Considering that an individual agent is relatively ignorant of the whole state of a complex system (Cilliers, 1998: 4-5) and that the vision and values that emerge are based on local (and thus limited) information necessitates formulating vision and values as "local" vision and values (Uhl-Bien & Marion, 2009: 645).

The emphasis on participation, relationships and interaction in complex systems raises questions of the relevance of hard management approaches. The next proposal claims that complex leaders must focus on soft values.

Proposition 3.9: Complex leaders focus on soft values

The results from a survey managed by the Center for Creative Leadership (CCL) indicate that the importance of individual leadership skills is shifting from being masculine- and relatively "hard" to become feminine- and "soft" (figure 12).

Individual leadership skill categories	*2002 rank*	*Future rank*
Leadership employees	1	1
Building and mending relationships	5	2
Change management	7	3
Participation management	6	4
Resourcefulness	2	5
Decisiveness	4	6
Doing whatever it takes	7	7
Straightforwardness and composure	3	8

Figure 12 - Leadership skills – past and future (Martin, 2007: 6)

The results from this survey are supported by a Complexity Approach to leadership where leadership is considered to be a social process of interaction instead of a mechanistic and technically oriented traditional approach (Griffin, 2005: 29). As a consequence, a Complexity Approach to leadership necessitates the use of what can be characterized as soft management tools instead of hard traditional management tools (Wheatley, 1999: 57; Falconer, 2007: 137; Fairholm, 2003: 375-380; Bondorowicz, 2010).

Implications of this view might be:

- Emotional intelligence[11] is far more important than technical intelligence, and human capital is more important than technical capital (Martin, 2007: 7; Wheatley, 146, 148-149, 154; Darwin, 2001, 482; Taylor, 2005: 132-133; Griffin & Stacey, 2005: 11; Karp & Helgø, 2007: 35).
- Soft value oriented leadership behaviour such as inspiring, empowering, listening, understanding and coaching can be considered to be crucial in complex systems (Falconer, 2007: 137; Fairholm, 2003: 375-380).
- Facilitation of process in order to support emergence is far more important than direction setting of specific behaviour through means of objectives and goals (Fairholm, 2004: 375-380; Stacey & Griffin, 2005: 122; Keene, 2000: 16-18; Marion & Uhl-Bien, 2001: 395; Wheatley, 1999: 39).

A “golden thread” throughout the propositions of a Complexity Approach to leadership has been the importance of relationships as the key determiner of everything. The next and last proposition discusses the importance of complex leaders shifting their main focus from macro-systems to micro-level interactions between people.

Proposition 3.10: Complex leadership focuses on micro-level interactions between people

In order to acknowledge that micro-level *interaction* between people is at the centre of attention implies that our understanding of organizations as merely collections of individuals who perform specific roles must be expanded to include the intricate and dynamic relationships between the interacting individuals (Osborn & Hunt, 2007: 330). In other words,

[11] Emotional intelligence is described by Sterret (2000: 2) as *“(..) the array of personal-management and social skills that allows one to succeed in the workplace and life in general. EQ* [emotional intelligence] *encompasses intuition, character, integrity, and motivation. It also includes good communication and relationship skills”*.

the abstract and intangible interaction is as crucial for our perception of reality as the physical and tangible objects.

Karp and Helgø (2007: 35) postulate that emphasis on micro-level interactions is crucial to facilitate bottom-up processes of self-organization. Implicit with a focus on interactions is the importance of a particular type of leadership's ability to induce/facilitate emotional awareness and empathic capacity. Emotional intelligence, as opposed to technical intelligence which often emphasizes rational reasoning (Tobin, 2005: 67), speaks for *"an increased capacity to think, feel, reflect and imagine"* (Stacey, 2005: 11).

Arguing that micro-level interactions is an essential focus of leaders necessarily implies that *if* an organization wants to facilitate change, what needs to be emphasized is the transformation and emergence of collective social patterns, not "inorganic" and "dead" aspects such as organizational structure or design (Sotolongo, 2007: 129-130). From this it follows that people are interpreted as *interdependent* individuals *within* society, not as independent- or dependent individuals (Cole, 2007: 222-229).

As mentioned earlier during the discussion around adaptive tension and disruption of existing patterns, and something this dissertation finds worthwhile stressing again, is that relationship-orientation, interaction, creativity and innovation have a potential destructive side due to possible generation of power-conflicts, uncertainty, anxiety and confusion (Edvardsen, 2000: 269-270; Parker & Stacey, 1997: 64; Stacey et al, 2000, 65). As opposed to traditional actions aimed at restoring balance such as clear lines of responsibility and authority, control systems and formal roles (Walker, 2006: 102), leadership in complex systems must focus on other mechanisms to reduce anxiety, for instance evolving individual and organizational capacity of living with anxiety and uncertainty through collective sense-making.

Initially in the discussion around "A Complexity Approach to leadership" this dissertation shortly elaborated on four system conditions of emergence, namely self-organization, disequilibrium, positive feedback and negative feedback. Through the discussion around leadership context, leadership roles and leadership behaviour a number of specific propositions have been formulated in anticipation of support for the system conditions of emergence, i.e. what may be referred to as a Complexity Approach to leadership.

The next and last section of this chapter will provide with an empirical example of a Complexity Approach to leadership.

4.2.4 Empirical Example of a Complexity Approach to Leadership

A comprehensive example of a Complexity Approach to leadership can be identified in the case of Al Qaeda. This international Islamic fundamentalist organization was established by Osama Bin Laden in 1989 and is associated with a number of terrorist acts such as the 9/11 attacks on the World Trade Center and USS Cole (Yemen, 2000) (Microsoft Encarta (14)).

One important pattern identified with Al Qaeda which links it particularly well to a Complexity Approach in general is the organization's ability to adapt to changing circumstances and provide surprising and creative actions to challenges. As such, dealing with the asymmetric strategy of Al Qaeda often leads conventional forces to *react* to Al Qaeda's actions rather than gaining initiative through *actions*.

Another pattern that emerges is that despite[12] Al-Qaeda's little reliance on- and its clearly inferior capacity of technology it is highly superior when it comes to adaptation. By operating on the "edge of chaos" through reliance on human capital and self-organizational properties the organization creates more opportunities than any technology may provide.

Marion & Uhl-Bien (2004: 3-29) state that Al-Qaeda's leadership is based on an indirect and decentralized approach to leadership. As the leadership is distributed throughout the dynamic system, the system is more *resilient* than using a centralized command and control (Cilliers, 1998: 110). The indirect approach to leadership is linked to a view where the strategic leaders have little to do with the ongoing management of the organization, but instead facilitate bottom-up processes. For instance, Osama Bin Laden and Ayman Muhammed Rabi' al-Zawahiri serve as "tags" of the struggle between the Muslim and the Western world providing purpose and collective sense-making through the use of intentional- and strongly symbolic language. The linkages to religious metaphors such as *Jihad*[13] serve as adaptive tension for the autonomous cells operating in a boundary less environment.

Hence, this type of leadership does not try to control events through hierarchical top-down structures, but inspires and motivates emergence and local initiative within the organization.

[12] The use of the word *despite* is perhaps more related to a traditional interpretation where the reliance on technology in general and information superiority through information technology in particular is characterized as the panacea of challenges. For more discussion on this topic the reader is asked to consult chapter 5 "Complexity and Military; Context, linkages and implications".

[13] By Microsoft Encarta (15)) defined as "*a campaign waged by Muslims in defense of the Islamic faith against people, organizations, or countries regarded as hostile to Islam*".

The emergence is supported by an informal, diffuse, open and dynamic networked structure with little emphasis on bureaucratic formalization, standardization and optimization.

A summary of the most important features of this chapter will now be provided.

4.3 Summary

The purpose of this chapter was to discuss the implications of a Complexity Approach for leadership. The following research objective was formulated.

Research objective 2: To investigate the implications of a Complexity Approach on leadership and how it differs from the traditional characteristics of leadership.

The main findings of this chapter are linked to the different sub-objectives. These sub-objectives and the findings are listed below in summary-format.

Research objective 3.1: To define leadership.

There are a high number of different definitions of leadership each emphasizing different aspects of leadership. One common denominator seems to be, however, that a traditional perception of leadership includes interaction where intentional influence by one person over another person or persons is present.

This dissertation does not make any distinction between management and leadership.

Research objective 3.2: To describe and discuss the traditional approach to leadership.

There is not one single integrated leadership theory explaining all aspects of leadership. The contemporary leadership debate is thus represented by a high number of different theories manifested in different approach to research. Some of the most relevant research directions are the power-influence approach, the trait approach, the behavioural approach, the situational approach and the transformational approach.

These research approaches together with a rational approach to management support the perception of a traditional approach to leadership being individual focused, top-down driven, rational and operating in a relatively closed system perspective.

Research objective 3.3: To describe the link between a traditional approach to leadership and Newtonian Principles.

A traditional approach to leadership is strongly linked to Newtonian characterizations such as reductionism, determinism and objectivity.

These principles support a view where the organization is characterized as a simple- or complicated system. The purpose of leadership is to optimize through incremental processes and maintain or create stability and predictability. The reliance on predictability and the belief that the future can be actively shaped by leaders support a closed-system perspective.

Research objective 3.4: To discuss a Complexity Approach to leadership

Research objective 3.4.1: To discuss and propose the context of a Complexity Approach to leadership

- Proposition 1.1: Leadership is intangible, abstract and interconnected
- Proposition 1.2: The context is unpredictable with unclear boundaries
- Proposition 1.3: A Complexity Approach to leadership has both individual – and systemic perspectives
- Proposition 1.4: The *role* and *work* of a complex leader arises as a result of an emerging process based on a dynamic interaction between human beings and the environment

Research objective 3.4.2: To discuss and propose leadership roles in a Complexity Approach

- Proposition 2.1: Complex leaders act in enabling leadership
- Proposition 2.2: Complex leaders act in administrative leadership
- Proposition 2.3: Complex leaders act in adaptive leadership

Research objective 3.4.3: To discuss and propose leadership behaviour in a Complexity Approach

- Proposition 3.1: Complex leaders disrupt existing patterns
- Proposition 3.2: Complex leaders lead by simple rules
- Proposition 3.3: Complex leaders act as sense-makers
- Proposition 3.4: Complex leaders favour an indirect approach to leadership
- Proposition 3.5: Complex leaders support bottom-up processes
- Proposition 3.6: Complex leaders value the informal processes in an organization
- Proposition 3.7: Complex leaders encourage novelty
- Proposition 3.8: A Complexity Approach to leadership substantiates the importance of vision and values as core elements of an emergent system's reference signal
- Proposition 3.9: Complex leaders focus on soft values
- Proposition 3.10: Complex leadership mainly focus on micro-level interactions between people

Research objective 3.4.4: To discuss an empirical example of a Complexity Approach to leadership

Al-Qaeda is used as a comprehensive example of a Complexity Approach to leadership by highlighting the leadership's indirect and decentralized approach, the leadership's role in "tags" and sense making, and the use of an open, distributed and networked structure to support self-organizational behaviour.

The next chapter will discuss military implications of a Complexity Approach.

Chapter 5: Complexity and Military: Context, Linkages and Implications

Machines don't fight wars, people do, and they use their minds

Colonel John Boyd

The purpose of this chapter is to investigate the implications of a Complexity Approach in general military activity.

A growing awareness of the increasing complexity of military operations is emerging among military personnel. A variety of different operations, multinational force structures, multifaceted rules of engagement (ROE) and an asymmetrical operating opponent are all aspects which impact on the perception of complexity. The possible impact of complexity raises questions of both descriptive and normative nature on how military organizations relate to this increasing complexity. In light of this, this dissertation finds it relevant to formulate the following research objective.

Research objective 3: *To investigate the implications a Complexity Approach in military organizations.*

In order to achieve research objective 3 this chapter is divided into multiple sub-objectives:

Research objective 4.1: To describe the current paradigm in military organizations.

Research objective 4.2: To discuss whether or not a military organization can be characterized as a complex system.

Research objective 4.3: To describe and discuss general military implications of a Complexity Approach.

Research objective 4.4: To describe and discuss propositions of a Complexity Approach in military organizations.

> Research objective 4.4.1: To describe and discuss general or principal propositions of a Complexity Approach in military organizations
>
> Research objective 4.4.2: To describe and discuss specific propositions of a Complexity Approach in military organizations

Research objective 4.5: To summarize the most important findings of this chapter.

With the purpose of attaining research objective 3 this chapter will initially describe what can be perceived as the traditional and current paradigm in military organizations based on Newtonian Principles. As an antithetical step, this dissertation will continue by discussing whether a military organization can be characterized as complex or not. Based on the belief that a military organization is a complex phenomenon this chapter will then describe and discuss the possible implications of a Complexity Approach. Based on the discussion in this chapter a number of propositions for a Complexity Approach in military organizations will be presented distinguishing between fundamental propositions and propositions relating to for instance doctrine, structure, planning and training. Finally, this dissertation will summarize the most important parts of this chapter and indicate initiatives for further study.

5.1 The Current Paradigm

If one listens to the news from conflict areas around the globe one quickly get the impression that military actions are reflected as a Newtonian system. The higher Officer being interviewed may talk about "operations" using "surgical" strikes in the defined "area of responsibility" and that the military units are working like "clockwork". These characterizations are all strong mechanistic metaphors which imply that the military is working like a machine (Schmitt, 1999: 100).

This part of the chapter will discuss Newtonian Science as the traditional and overarching paradigm in military thinking. The discussion will be initiated by a general description of what can be perceived as a Newtonian Approach to warfare, command and control, as well as organizational military structure and planning. In keeping with this, the notion of Revolution in Military Affairs (RMA) will be commented on before the implications of a Newtonian Approach are pointed out.

Ilachinski (1996: 45) argues that our perception of reality is structured by metaphors. Thus, the words we choose to describe different phenomena often represent our philosophical foundation. As described above, Newtonian images are deeply ingrained in military terminology.

Another example of this is the Newtonian characterization of combat as "*a collision between two billiard-balls"* (Ilachinski, 1996: 46). This metaphor symbolizes warfare as a relatively simple system (see chapter 3), which is mechanistic and "closed". The outcome of the

"collision" is mainly based on two factors, namely the scale of manpower and firepower (Bar-Yam, 2003: 1). This approach to warfare is often referred to as attrition warfare, where the body count and targets destroyed seem to be the measurement of success. Technical superiority and "Force Multipliers" are crucial elements in the attrition warfare approach, in addition to creating a competitive advantage (Beckerman, 1999: 2). Assuming that the enemy follows the same symmetrical strategy and that one's own forces have an advantage of scale and technical superiority, an attrition warfare strategy may serve its suggested purpose. However, as the overwhelming empirical evidence teaches us, the use of massive force in a conventional way is less efficient against asymmetrical strategies.

Adams (2000: 55) describes military organizations as *"the very textbook of bureaucratic structure"*. In bureaucracies formalization and standardization is essential for creating optimized, effective and efficient execution of standardized activities (Robbins & Barnwell, 2002: 125). This specialization of function is linked to economies of scale and the desire to produce predictable and reliable results (Adams, 2000: 55). A bureaucratic structure is highly suitable for a stable environment, but is on the other hand rigid and static making it highly unsuitable for a dynamic and open environment (Robbins & Barnwell, 2002: 124).

A hierarchical command structure is perhaps one of the most profound characteristics of traditional military organizations and is naturally linked to a bureaucratic structure. A hierarchical command structure can be described as *"an organization or groups whose members are arranged in ranks, e.g. in ranks of power and seniority"* (Microsoft Encarta (16)). This approach to command and control is often characterized as top-down driven and authoritarian. According to Bar-Yam (2003: 1, 8) hierarchical command structures are usually good to execute large scale and conventional operations, but have more limited relevance when it comes to responding to complexity.

Rinaldi (1999: 114) states that a traditional approach to command and control is highly doctrinaire and structured around formalized protocols and rules. The importance of unison and an all encompassing doctrine serves the purpose of creating order, certainty and precision from an environment that can inherently be described as uncertain and unstable. Schmitt (1999: 101) argues that Newtonian command and control is microscopic, which manifests itself in a highly synchronized and wide-ranging set of plans and orders. Generals rule the battlefield as chess-players rules the chess-board. They do this by luring the opponent into a trap and strategically moving its pieces into positions. The process of change is interpreted as an incremental process which can be managed by measures of prediction, control and stability (Calhoun, 2004: 49-50). The ultimate object of traditional command and

control is thus to create balance and impose order in a top-down manner as illustrated in figure 13.

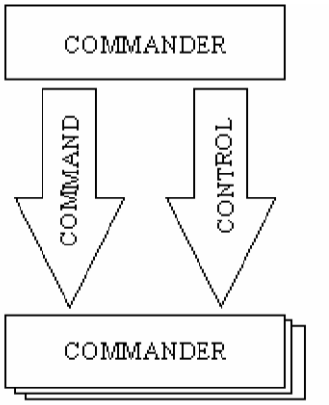


Figure 13 - Newtonian command and control (Schmitt, 1999: 102)

The planning processes and policy- making is, as a natural consequence of being influenced by a bureaucratic and hierarchical culture, based on prediction and the quest for optimal solutions. Richardson, Mathieson and Cilliers (2000: 32) label this as a positivistic paradigm which follows the rules of rationality. In order to optimize the chance of success a military planner must first of all generate a picture of the anticipated future, determine an adequate response to the prediction and finally monitor and evaluate the implementation of the concept (Calhoun, 2004: 4). Effectiveness and efficiency of functions are thus far more important than innovation and novelty (Calhoun, 2004: 5).

The importance of control and prediction in the current military paradigm has also manifested itself in the reliance on technology as the panacea to military challenges. The next section will discuss the Revolution in Military Affairs (RMA).

5.1.1 Revolution in Military Affairs (RMA)

Revolution in Military Affairs (RMA) or Information Revolution in Military Affairs (I-RMA) refers to the belief that complicated technology is the driving force behind change and the panacea for military challenges.

The technological development and indeed the vast implementation of these systems into military concepts have increased the information availability for decision-makers on all levels of the military organization. The development of the battle can be monitored live by decision-makers through sophisticated technology and orders can effectively be issued to combat units. Although the technology might provide more information, a logical consequence is an

increased system complexity and thus a more chaotic and unpredictable system (Pfaff, 2000: 86). This is not necessarily a bad thing. However, a more essential aspect is perhaps how a military organization chooses to respond to this complexity.

Some of the rationale behind the reliance on technological development as the panacea for military challenges is the belief that complex challenges must be conquered by even more complex solutions. Because the current military environment is heavily focused on technology, the search for solutions has automatically been within the field of technology (Richardson et al, 2000: 33). Although complicated computer models and other sophisticated technology (without a doubt) has its relevance in a number of contexts, it still comprises the underlying pitfalls of a quantitative framework, and must be used with caution as the remedy for complex challenges.

Calhoun (2004: 8) argues that the intent with the RMA is to lift the "fog" of war by reducing uncertainty, while simultaneously increasing predictability. While all previous Western military revolutions have been *"uncontrollable, unpredictable and unforeseeable",* the current RMA is based on using new and sometimes futuristic technology as the conceptual foundation for transformation (Calhoun, 2004: 20). The revolution is thus not so much of a *"sudden, radical or complete change",* but instead based on reductionism and incremental change (Calhoun, 2004: 22). Even more dangerous, Calhoun argues, is the potential pitfall that *"future vision becomes current doctrine in anticipation of the hoped-for advantages of future technological advances"* (Calhoun, 2004: 23). Although the focus of this discussion lies with a semantic, various key elements are highlighted. The strategy of having information superiority is perceived as decreasing the unpredictability of war and as a consequence creating opportunities for synergies and optimization.

Boal and Schultz (2007: 417) note that an explicitly focus on technology as a means of linking agents in a system potentially undermines the organizations, as the entire social system of an organizations is crucial in developing a sustainable and functional organization. Daltveit et al (2010:21) uses the 2006 Lebanon-Israel War as an example where an exaggerated belief of what may be achieved through technology was falsified. The Strategic Trend Program (2010: 17) further highlights that "*the West is likely to lose its broad qualitative advantage in military equipment in some areas, challenging a Western paradigm of war; that technology can replace mass".*

The discussion of the current paradigm and reliance on the RMA evidently raises a number of questions concerning implications. The next section describes these implications by relating them to characterizations such as linearity, reductionism, determinism and closed systems thinking.

5.1.2 Key Implications of the Current Paradigm

Embracing Newtonian Principles as the philosophical cornerstone of military activity produces several ramifications for military organizations.

Linear thinking and the proportional relationship between cause and effect is perhaps the most fundamental principle of Newtonian thinking and is well represented in traditional military thinking. Complicated problems require complicated solutions and little effort will most likely have little impact (Schmitt, 1999: 100). What this means – by way of an example- is that in order to affect the enemies' center of gravity (COG) massive resources must be set forth. The perception of linearity enables the development of rules and protocols to achieve a certain outcome. For instance, the three-to-one rule of combat is a linear rule where it is assumed that a three-to-one ratio in scale is necessary to succeed if attacking a defending enemy (Rinaldi, 1999: 114). The "Lanchester Mechanism" is another example where the relationship between kill-rate and attrition is proportional, i.e. if we kill 20% of the enemy forces, the rate of attrition will extract by a linear 20 % (Beckerman, 1999: 2).

The second implication of a Newtonian Approach is a methodology based on *reductionism* (Rinaldi, 1999: 114). Reductionism refers to the belief that a system can and should be understood by studying and analyzing the parts of a system (Fernandez et al, 2007: 171). The whole is therefore a sum of its parts (Nilsson, 2007: 247). Dent and Holt (2001: 96-98) argue that reductionism is especially evident in a peace time military organization. The bureaucratic peace time organization focuses on analysis of the isolated parts in contrast to looking at the organization from a synthesis perspective where interaction is the essential aspect. The US Air Force's approach to knowledge management is highlighted as an example of "stove-piping" where the organization solely focuses on specialization of functions. Rinaldi (1999: 114) characterizes the history of warfare as full of reductionism. For instance, the targeting process done by air planners[14] where the enemy is broken down to a number of target systems, then analyzed as separate systems and the effect of each mission is calculated into a total sum of the overall air campaign. Dent et al (2001: 98) uses the US-bombing of the Chinese Embassy in Serbia during Operation Allied Forces as an example of the consequences poor interdependence may cause. In this case, the air campaign can from an isolated perspective be characterized as successful due to the destruction of the target, but the effectiveness of the whole operation became a catastrophe due to poor targeting and poor intelligence.

[14] I.e. personnel who plans activities related to air operations

The third implication of a Newtonian Approach is the perception that future events are *deterministically predictable* (Rinaldi, 1999: 114). As was the case with the previously described implications, determinism is a phenomenon which is evident at all levels of the organization in peace and war. For instance, the so called “transformation” process of certain Armed Forces relies on incremental change mechanisms with strong emphasis on goal obtainment based on prediction of what the future enemy will look like, what the future combat environment is most likely will be etc. On a tactical level one of the key elements in the operational analysis (OA) is the prediction of the enemy course of action (COA), i.e. either how the enemy force will act or react. Based on the prediction of how the enemy will act, a plan is constructed to counter-act the anticipated enemy behavior. The logical consequence of a deterministic approach is, of course, a continual strive for total situational awareness through the generation of greater quantities and quality of intelligence. These evidently serve as the foundation for the commander’s prediction of the future.

The fourth and final implication is the perception of a military organization operating as a *closed system* (Schmitt, 1999: 101). In a closed system the external environment of the organization has limited impact on the functioning and as a consequence the focus is on internal processes and optimization of the structure. Assuming a closed-system-view the success on the battlefield will evidently depend on the degree of scale and optimization of this scale, i.e. the parts of the machine must be well-oiled, well-trimmed and the production line must be carefully planned to achieve the desired output. This inward focus on efficiency can be reflected in formulations such as cost-effectiveness and cost-efficiency. Possible question to test such effectiveness and efficiency might be: What should I do to get as much value for the resources I use? In such a paradigm quantitative measures such as body counts and number of tanks destroyed become the outermost important tool to analyze the development of the battle (Rinaldi, 1999: 114).

One might ask the critical question: is the current paradigm, as it is described here, representative of all Armed Forces? There is of course no definite answer to this question, but one might venture to claim it has *relevance* in all military organizations. The description and discussion around the current Newtonian paradigm perhaps reflects an ideal type of a traditional military approach, however, it serves as a valid and relevant framework for highlighting the philosophical foundation of a traditional approach and its limitations.

A bureaucratic and hierarchical approach based on linearity, reductionism, determinism and closed systems thinking is inherently not a bad thing. Great progress and successes have been achieved on multiple arenas using Newtonian Principles. One must, however, be cautious of using historic successes as a template for future successes. The limitations of

Newtonian thinking have been illustrated throughout this dissertation in different application situations, and a pattern is emerging; A Newtonian Approach is not a suitable means of responding to complexity, and thus of less relevance as a philosophical foundation for the modern military organization than initially projected.

This dissertation will now turns over to the debate around a Complexity Approach and the relevance of this theory for military organization, starting with an investigation of whether a military organization can be characterized as complex or not.

5.2 The Military as a Complex System

Cloete (2006) argues that many public sector systems are multi-dimensional, dynamic and operate far-from-equilibrium, thus embracing many of the characteristics of a complex system. Parellada (2007) further argues that every human organization, e.g. a laboratory, a factory, an institution etc, is a Social Organization (SO) that possesses a number of characteristics that coincide with Complexity Principles.

Pfaff (2000: 84) points out that technological and conceptual development in military affairs in the last decades have made it more probable that seemingly small changes in the initial conditions of the system might have dramatic changes for the overall system. In other words, the organizational life is a non-linear phenomenon. The interpretation of military affairs as a non-linear phenomenon is, however, not something new. Military theorists such as Sun-Tzu and Karl von Clausewitz describe war as a non-linear phenomenon with processes of continuous change (Beyerchen, 1999: 71; Dent et al, 2001: 90-91). The dynamic and organic nature of war can be compared to the behavior of water as it finds the route of least resistance. This fluidity and stress on war as something “living” is captured by Karl von Clausewitz:

“*War is an activity of the will, not – like the mechanical arts – exerted upon dead matter, but upon a living and reacting force”* (Clausewitz, 1965: 111-112).

In light of this, the next section will discuss the military as a complex system using the characteristics of a complex system as outlined and described by Cilliers (1998).

5.2.1 Characteristics of Complex Systems

This dissertation has so far provided some empirical examples and explanations for the increasing complexity of the environment that comprises military organizations. In chapter 3 this dissertation discussed the characteristics of complex systems amongst others by using a given national financial system as the empirical framework. The next step is now to use a military organization as the empirical framework and thus clarify to what extent a military organization can be characterized as a complex system or not.

XI. A complex system consists of a *large number* of agents or elements (Cilliers, 1998: 3).

A military organization usually consists of a large number of agents. The agents can be defined as either individuals or units at different levels of the hierarchy or external agents.

XII. The many elements of complex systems have to *interact* and the relationships between these elements have to be dynamic (Cilliers, 1998: 3).

The agents interact on a number of different arenas and levels. Soldiers within a team interact with each other, teams interact with other teams, a platoon may interact with other platoons etc. The interaction does not need to be on the same level (vertically), but can also take place horizontally (in the hierarchy).

The parameters of the relationships are in a continuous process of change. An agent does not interact with a stable set of agents, but changes according to flux in the environment. For instance, task forces can be organized owing to certain capacity requirements in specific missions.

XIII. The interaction needs to be *fairly rich*, i.e. one component does not affect just one other component, but multiple other elements as well (Cilliers, 1998: 3-4).

On the battlefield the action of one unit affects a number of other units, independent of what level the action initially takes place on. For instance, on team level the actions of one individual soldier can affect all the other soldiers in that team.

Policies and regulations issued by one unit may affect all units in the organization. Similarly, the failure (for instance due to disobedience) of one unit to follow specific rules and regulations may affect a number of other units.

XIV. The interactions must be of a *non-linear character*. Without non-linearity, a complex system is not possible (Cilliers, 1998: 4).

The interaction between agents will most likely change over a defined period of time. As described on the latter bullet point, failure to follow specific orders from one unit may act as a "change agent" and affect other units resulting in a similar failure to follow their orders.

As illustrated, a seemingly small action can grow causing wide-spread effects. One wrong decision made by a single soldier in Kabul on a lower tactical level might have an effect in the United Nations Security Council.

XV. Information is primarily received from elements in close proximity, i.e. the *interactions are relatively short range*, but they do not rule out a wide-range influence (Cilliers, 1998: 4).

Agents usually interact with their immediate environment. A soldier in one team interacts with the other soldiers in their team. Their team interacts with the neighbouring teams etc. As illustrated on the latter point, however, the relatively short range interaction may generate a more wide-spread effect through non-linear processes and positive feedback loops.

XVI. A complex system has *feedback-loops* that can be either positive or negative (Cilliers, 1998: 4).

Actions taken by agents will create either negative- or positive feedback. The traditional and current Newtonian paradigm seeks to create balance and stability through negative feedback (identify the gap and close the gap). Positive feedback, on the other hand, reflects destabilization and reinforcement. For instance, the plan to create stability in Iraq after the high-intensity battle has created more destabilization and an amplification of internal and external threats to United States' interests than balance and stability. This example also substantiates the fact that positive feedback is not intrinsically positive in the mere sense of the word, but rather an expression of a far-from-equilibrium state of mind.

XVII. Complex systems interact with their environment. In other words, complex systems are often *open systems*. A closed system, on the other hand, does not interact with its

environment to the same degree as an open system, and is merely a simple or complicated system (Cilliers, 1998: 4).

Military agents and military systems are constantly being affected by political-, socio-economical-, technical - and environmental factors and it is difficult, if not impossible, to delineate the exact borders of the military system. The fall of the Soviet Union and 9/11 attacks, for instance, have affected all aspects of military development.

XVIII. Equilibrium is equivalent with stagnation and death. Complex systems operate in a *far-from-equilibrium environment* constantly changing and creating opportunities for creativity and change (Cilliers, 1998: 4).

Although many military organizations, and especially the peace-time organizations, strive for equilibrium, the environment is in constant flux and disequilibrium. An organization that fails to adapt to the *de facto* circumstances, either when it is operational in war or economically, as in peace time, may end up being irrelevant. The initial battle-strategy in Vietnam may serve as a comprehensive example of an ill-suited strategy, which eventually ended in military and political failure. So, it is a difference related to descriptive and the normative situations. While many military organizations still cling to the Newtonian cliff, they should focus on adaptation and living with change, in order to achieve the desired reaction.

XIX. *The history of a system is an important element* in a complex system, i.e. the past of a complex system is "*co-responsible for* [its] *present behaviour"* (Cilliers, 1998: 4; Smith, 2007: 194).

The actions of a military organization are greatly influenced by the history of the environment and its past environment. From a social and cultural perspective, the actions and behaviour of individuals are in a very pronounced sense based on their past education and experience. The actions of today's organization depend largely on yesterday's actions, e.g. from an operational point of view the decisions made today on how to move the units largely depend on historic data.

XX. The pattern of interaction between agents results in an emerging complexity. Each actor acts or reacts based on *local information* and does not have a holistic view (Cilliers, 1998: 4-5).

> The individual soldier and decision-makers on all levels of a military organization act on local information. They do not know what all the other elements of the environment are doing and are therefore acting almost solely on the information they have available. For instance, when a company-commander makes a decision it may be based on relatively local factors such as: what is the status of the company in terms of firepower and logistics? What are the risk-factors? What will the consequences of defeat be? What is the weakness of the enemy in my area of operations?

Authors such as Adams (2000:3), Dent et al (2001:102), Bar-Yam (2003:2) and Blakesley (2005: 69) all support the perception of a military organization being a complex system. However, there is empirical evidence to suggest that despite the acknowledgement of the appearance and influence of complexity, a vast number of military organizations still base their actions on Newtonian Principles.

Based on the belief that a military system is indeed complex, a number of implications arise. These form the discussion component of the next section.

5.3 Military Implications of a Complexity Approach

The implications of a Complexity Approach to military organizations will be discussed using three approaches. First and foremost, the applicability of a Complexity Approach to general military phenomena will be discussed. Second, a list of general propositions for a Complexity Approach to military organizations will be presented and discussed referring to matters of fundamental nature. Third and finally, a list of specific propositions for a Complexity Approach to military organizations will be described and discussed using categories such as doctrine, strategy, policies and structure as the ramification for the presentation.

5.3.1 Applicability of a Complexity Approach to Military Organizations

Bar-Yam (2003:1) argues that the emerging recognition of complexity in military organizations rests on three main pillars. Conventional military units all over the world are forced to engage in more complex conflicts characterized by unclear boundaries and asymmetry. The second main pillar is the development and availability of sophisticated technology which increases the alternatives of action and simultaneously increases the complexity of the structure (Pfaff, 2000: 86; Bar-Yam, 2003: 1). The third and final pillar refers to the emergence of a Complexity Approach as a conceptual foundation and

theoretical lens through which to understand military phenomena (Rinaldi, 1999: 112; Bar-Yam, 2003: 1).

Before continuing with discussing the applicability of a Complexity Approach to military organizations let us first recapitulate what is actually meant by "complexity". In chapter 3 this dissertation presented a number of definitions of complexity. Although no uniform and generally acknowledged definition of complexity exists, common denominators such as non-linearity, underlying order, self-organization and emergence are highlighted (e.g. Zimmerman & Plsek, 1998 and Waldrop, 1992). Another aspect in the meaning of "complexity" refers to the *"variety of possible actions that can be taken"* (Bar-Yam, 2003: 1) or the degree of differentiation within the organization (Robbins & Barnwell, 2002: 105). While the first description refers to the "concept" of complexity, the two latter explanations refer to the "expression" of complexity in organization. This dissertation will specify the relevant definition used for complexity where necessary.

5.3.1.1 General applicability

Ilachinski (1996), a pioneer in the investigation of general applicability of a Complexity Approach to the study of Land Warfare, identifies eight tiers of applicability. Figure 14 illustrates the anticipated risk versus potential payoff ratio by implementing a Complexity Approach on the specific tiers[15].

[15] The author strongly emphasizes that the ratio is highly speculative and is only provided for illustrative purposes.

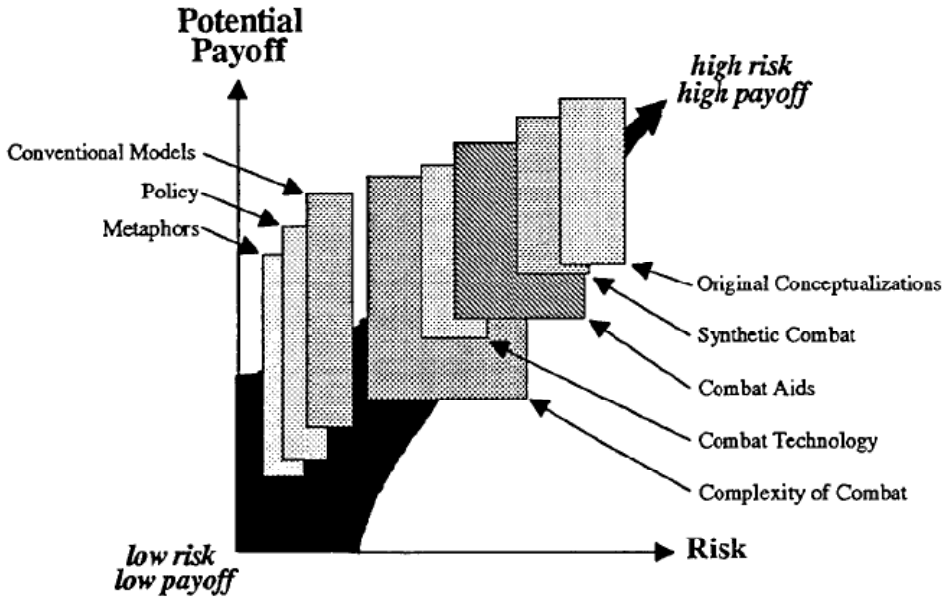


Figure 14 - Risk versus potential payoff (Ilachinski, 1996: 40)

The first tier refers to a new set of *metaphors* which represent a new perception of warfare as being a conflict between two living organisms with self-organizational and interconnected agents (Ilachinski, 1996: 43). The second tier suggests that the purpose of policy-making must change from being a means of stabilization, to an emphasis of co-evolution instead (Ilachinski, 1996: 55). The third tier reflects the incorporation of Complexity Principles into existing conventional models, for instance the Lanchester equations and arms-race models (Ilachinski, 1996: 60). The fourth tier describes how the use of tools from the Complexity Sciences may serve as a foundation for identifying patterns in military operations (Ilachinski, 1996: 68). The fifth and sixth tiers represent how knowledge of complexity can be used to enhance existing combat technologies and general combat aids (Ilachinski, 1996: 80, 85), something that might reflect the current technologies in the I-RMA. The seventh tier consists of creating synthetic combat environments to allow training and research, for instance the use of multi-agent-based models and combat models based on complex adaptive modeling systems (Ilachinski, 1996: 97). The eighth and final tier describes the impact Complexity Principles may have on the development of completely new conceptualizations of combat, for instance the concept of fire-ant warfare (Ilachinski, 1996: 105, 117).

A number of military organizations, and perhaps first and foremost the United States Army, have in the last decade taken multiple steps towards the integration of Complexity Principles in a number of the tiers proposed by Ilachinski. As discussed earlier, the development of sophisticated technologies have perhaps been empahsized as the promised panacea, but without changes in doctrine and policies it may paradoxically be counter-productive in the quest for success.

A number of the tiers described above will be further elaborated on during the course of this chapter. While war in a Newtonian system is conceived as being founded on linearity, reductionism, determinism, and closed systems thinking, a Complexity Approach emphasizes other principles. Let us now turn to the perception of war as seen through the lenses of complexity.

5.3.1.2 Perception of War Seen Through the Lenses of Complexity

Adams (2000: 54) suggests that a Complexity Approach offers "the real military revolution", not just as metaphor, but a revolution in the basic sense. If war *de facto* is something completely different than generally understood, the implications should be described as nothing shorter than a shift in paradigm.

War can be understood as a non-linear system with self-organizational and emergent properties. It is open, distributed, dynamic, and small changes to initial conditions might grow to become big changes through positive feedback-loops (Ilachinski, 1996: 2; Echeverria, 1997: 30; Schmitt, 1999: 103; Beckerman, 1999: 2; Beyerchen, 1999: 71; Adams, 2000: 55; Dent et al, 2001: 90; Bar-Yam, 2003: 1).

A non-linear system does not adhere to the linear law of additivity, but behaves inversely unproportional (Beckerman, 1999: 3). Prigogine's work on dissipative systems, as discussed in chapter 3, teaches us that systems close to equilibrium act in a fairly linear way, while systems operating far-from-equilibrium becomes highly sensitive to the fluctuations (Parker & Stacey, 1997: 37). The unproportional and far-from-equilibrium nature of non-linear systems comprise a mix of opportunity and threat for military organizations (Beyerchen, 1999: 74). On the one hand, it may be perceived as a threat due to the implication of less control and possibility of total randomness, but on the other hand operating on the "edge of chaos" increases the organization's ability to adapt.

The real threat, the Complexity Sciences argues, is when a system comes too close to equilibrium and is not able to respond adequately to changing circumstances. The First World War may serve as a suitable example of how equilibrium is not a suitable strategy to conquer complex systems (Blakesley, 2005: 71). When forces engaged in battle on the Western Front equilibrium was quickly reached. A superior enemy in term of scale would quickly defeat a smaller force and evenly matched opponents would eventually end in a stalemate (Pfaff, 2000: 84). The battlefield was static and attrition with an enormous amount of force was the main means to conquer the enemy.

The German strategy and tactics in the initial phases of the Second World War teaches us some of the benefits of non-linearity. By using their equipment and resources in unexpected ways (e.g. Blitzkrieg), the German forces introduced instability and dynamism in the system, something which the Allied Forces where not prepared for. The dynamic, rapid and innovative German Forces quickly outmanoeuvred the slow-moving and powerful Allied Formations and manifested the idea that small changes in the system created over all dramatic effects through positive- and non-linear feedback loops (Pfaff, 2000: 85).

Because war can be characterized as an *open system* which interacts with its environment, the boundaries of the system are diffuse. The consequence of this is a perception of reality as the emergent and collective behaviour of many individual agents interacting in close proximity responding to local conditions and available information (Schmitt, 1999: 105). In other words, the knowledge of isolated parts of a system, for instance the known structure of the enemy, is not sufficient or adequate to predict the behaviour of the whole system (reductionism). The emergent behaviour of war is thus a *bottom-up approach* where operations evolve as a result of interaction between different interrelated parts.

The view on war as a "*collision between two billiard-balls* "(Ilachinski, 1996: 46) is, according to a Complexity Approach, substituted by a view of war as "*an organic exchange of energy, matter and information"* (Schmitt, 1999: 104). As the vast number of units and soldiers interact with each other in unique local conditions, energy, matter and information are being exchanged and a sustainable complex military system reacts to the changing circumstances by adapting. As an open system, the interaction and local conditions are (mutually) affected by political, economical, socio-cultural and environmental factors, for instance the weather, the topography, the international opinion etc. (figure 15).

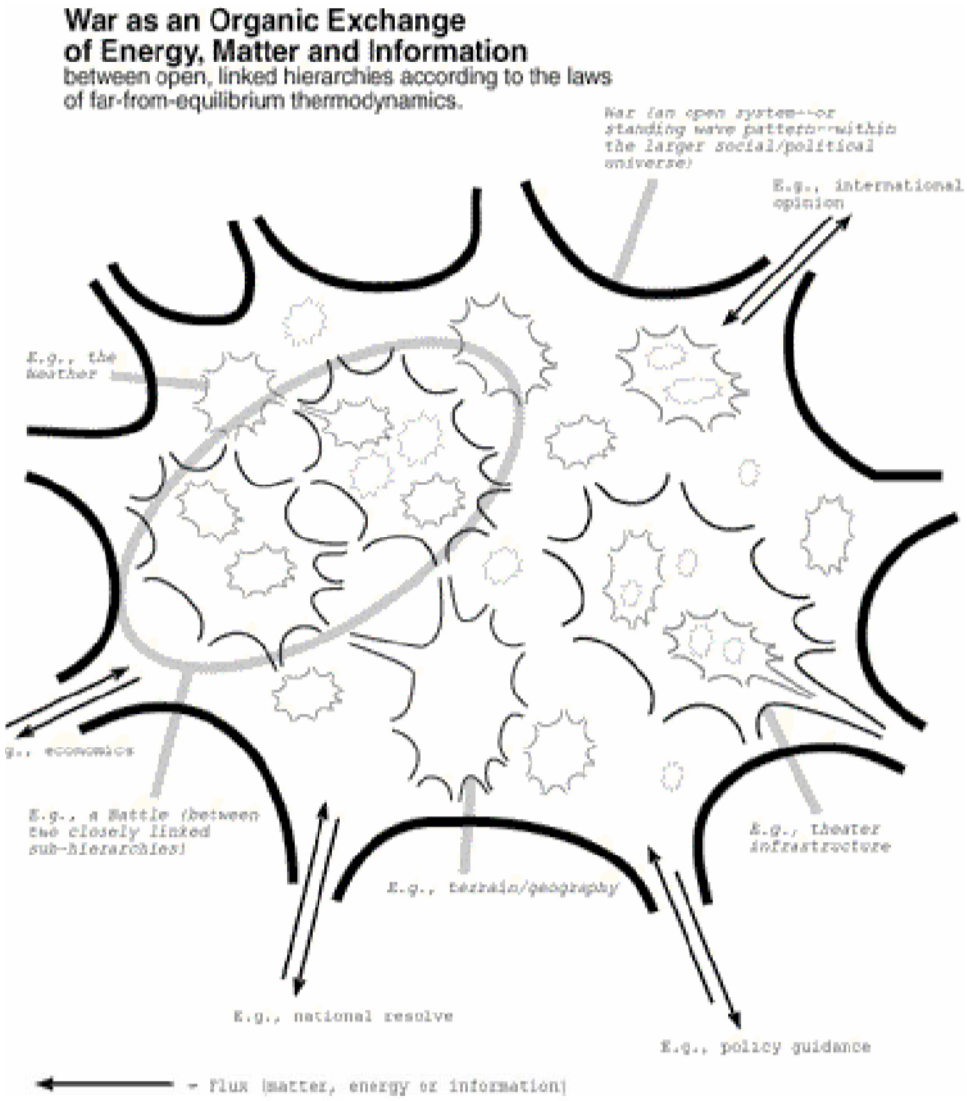


Figure 15 - War as an organic exchange of energy, matter and information (Schmitt, 1999: 104)

As discussed under “Characteristics of Complex Systems”, the nature of the interaction is of paramount importance. A machine, which is highly effective and optimizes towards specific objectives, consists of a large number of parts which interact in a relatively causal and closed way, but is merely a simple or complicated system. The interaction in a complex system, e.g. war, however, is *interconnected* and full of surprises. The interaction between agents is often rich, dynamic and non-linear, which makes small changes evolve into great changes, or of course, the other way around.

Table 5 offers a good overview over the properties of a Newtonian – and Complexity Approach. As the observant reader might notice, the content of the table coincided pointedly with the clock-work – and snake pit metaphors described in chapter 3 (Darwin, 2001: 485). While a Newtonian perspective on war on the one hand emphasizes a mechanistic and quantitative approach characterized by “engineered” control, order, plans and optimization, a

Complexity Approach on the other hand embraces the perspective in which war is characterized as a living organism, inherently disordered, unpredictable and far-from-equilibrium.

Newtonian metaphor of war	Complexity metaphor of war
Basic elements are “quantities”	Basic elements are “patterns”
Behavior is contingent and knowable	Behavior is emergent and often unexpected
Clock-work precision	Open-ended unfolding
Closed system	Open system
Complexity breeds complexity	Complexity can breed simplicity and vice versa
Deterministic	Deterministic chaotic
Equilibrium	Far-from-equilibrium
Individualistic	Collective
Linear	Non-linear
Linear causation	Feedback loop/circular causality
Mechanistic dynamics	Evolutionary dynamics
Military “operation”	Military “evolution”
Combat as collision between Newtonian “billiard balls”	Combat as self-organized ecology of living “fluids”
Order	Inherent disorder
Predesigned	Emergent
Predictable	Unpredictable
Quantitative	Qualitative
Reductionist	Holistic
Solution	Process and adaptation
Stability	“Edge of chaos”
Top down	Bottom up

Table 5 – metaphors (adapted from Ilachinski, 1996)

Perhaps the most important lessons learned by looking at war through the lenses of the Complexity Sciences are the notions of predictability and control. As this dissertation has discussed, the current Newtonian paradigm, strongly supported by the current RMA, all point in the direction of desired control and better predictability. Sophisticated technology and information superiority will without doubt create tremendous results in some cases, but may be misleading in their quest for understanding complexity. Despite the effort, war remains *de facto* an uncertain- an uncontrollable phenomenon from which military organizations must learn to behave like a natural organism. The next section will present general and specific propositions for a Complexity Approach in military organizations.

5.4 Proposition for a Complexity Approach in Military Organizations

The propositions for a Complexity Approach in military organizations are organized into two separate approaches for the purposes of this discussion. First of all, some general propositions will be discussed focusing on fundamental issues. Secondly, specific propositions will be forwarded discussing the issue of doctrine, strategy, structure, policy, planning, analysis and training.

Although this dissertation aims at capturing the most essential elements of a military organization, there are a number of aspects these propositions do not elaborate on (for instance competencies which will be presented in chapter 7 and chapter 8). This dissertation requests that the reader focus on the principles and from that point of view reflect on what consequences a Complexity Approach may have to these aspects.

5.4.1 General propositions

Proposition 1.1: *In order to adapt to a dynamic and constantly changing environment military organizations should incorporate Complexity Principles*

This dissertation has substantiated the view of change not something one must conquer through imposing control, stability and prediction, but rather as something natural, nourishing and positive with which the organization must learn to co-evolve.

A Complexity Approach offers a comprehensive framework for military organizations to use as their fundamental frame of reference for continuous and dynamic transformation. This framework captures the inherently unpredictable and complex nature of military organizations as complex systems (Calhoun, 2004: 69) and provides simultaneously an all encompassing intellectual tool from which to understand complex phenomena (Bar-Yam, 2003: 1).

Theoretical, but more importantly, empirical evidence supports the belief that military organizations should be increasingly non-linear, holistic, interdependent and self-organizing (Dent et al, 2001: 93).

Non-linearity: A Military organization must acknowledge that war- and peace time organizational life is highly non-linear. Because the organization operates in a far-from-equilibrium state, any attempt at pushing it back to equilibrium inhibits creativity, flexibility and innovation. A fundamental focus on relationships and not objects itself as the key

determiner of everything, speaks for the importance of processes and human relations over objectives and technology. Objectives and miscellaneous measures of efficiency and effectiveness might be suitable for linear systems, but may paradoxically be counter-productive in non-linear systems.

Holistic: A reductionist mentality focuses on the parts of a system, and not on the interaction. The whole is not equal to the sum of its parts, but may represent a far greater (or lesser) output than the linear equation has made provision for. A positivistic approach fails to understand the organizational processes and subsequently inhibits the organization from reaching its full potential. A holistic approach represents the patterns which emerge over time in the military organization, and not the analysis of specific and short term phenomena.

Interdependency: A military organization is a web of interdependent agents, whether it is on individual- , tactical – or strategic level. *"No one can step outside of their interaction with others"* (Stacey & Griffin, 2005: 9-10), as we co-create the organization's and individuals' future based on local interaction. From a Newtonian perspective, solutions and problems are often characterized using assumptions of linear cause and effect models (Dent et al, 2000: 99). For instance, if a mission fails the evaluation might concentrate on two main questions: Who is to blame? What caused this problem? Military organizations must learn seek answers from the fundamental processes in the organization, and not merely identify symptomatic problems that can easily be "fixed" or "repaired".

Self-organization: Self-organization refers to a property of complex systems which operate far-from-equilibrium and reacts to changes in an adaptive and spontaneous manner (Cilliers, 1999: 90). This is an antithesis to the top-down control mechanisms of traditional military organization. Using traditional terms it possesses far more potential for efficiency and optimization than a top-down driven process because it responds adaptively to fluctuations in the system and evolves towards self-organizational criticality. In a complex environment top-down imposed control is not possible, nor desirable, as it inhibits creative- and flexible responses. Self-organization does not necessarily mean that military organizations should abandon existing structures and roles, but explore the opportunities of using it in a different way to facilitate bottom-up processes. For instance, the use of fixed attractors such as goal obtainment might be of less value than "strange" attractors such as culture and value.

As self-organization and emergence increase over time in complexity (Cilliers, 1998: 92) military organizations must exhibit patience with the organizational processes and allow it to "grow" at its own pace. A "quick fix" seldom offers a lasting and sustainable solution to a problem.

Proposition 1.2: *A Complexity Approach should be applied to the whole organization*

War can be understood as a non-linear system with self-organizational and emergent properties. This view has growing support among military theorists and attempts to incorporate Complexity Principles into the battlefield are more and more evident. In wartime situations leaders are taught to improvise, adapt and overcome, and display initiative within the frame of Commanders' intent (Calhoun, 2004: 70). In peace time organization the adaptive tension is substituted with a bureaucratic approach where regulations and rules are the product of rational and objective planning processes (Dent et al, 2000: 90-105). The applicability of a Complexity Approach is, however, as relevant to the peace time organization as for the war time organization, and exhibits all the characteristics of a complex system.

A Complexity Approach should be incorporated within the whole organization as a fundamental frame of reference, whether it is peace or war. This will facilitate the development of practical understanding and application of Complexity Principles in Officers and soldiers, as well as generate enormous potential for innovation and creativity. Incorporating Complexity Principles into selected parts of the system will be an act based on reductionism and atomism. Keeping in mind a complex system's self-organizational properties and sensitivity to initial conditions, this dissertation speaks for familiarization of Complexity Principles at all levels of the hierarchical system.

Proposition 1.3: *A Complexity Approach implies full-spectrum organizational change*

Using the current Newtonian paradigm as a starting point, the incorporation of a Complexity Approach implies all encompassing changes in fundamental processes of military organizations.

For instance, a changing set of metaphors affect the parameters of our conversations with the result that what and how we choose to formulate ourselves orally and written will also be changed. Policies and plans are not made to achieve balance based on rational and objective processes, but instead to support the emergent and self-organizational processes. Control is not merely imposed through top-down regulations, but is also an expression of the bottom-up process where patterns emerge over time. Conventional war strategies and conceptualizations of combat are substituted by non-linear and asymmetric strategies and the traditional *formal* hierarchical and bureaucratic structure *may* meet its counterpart in a more networked based structure.

The most important part, the human beings, would of course be most affected by the incorporation of a Complexity Approach. The current individual-, leadership - and overall organizational competencies might not be suitable for complex systems' thinking and would thus need to be reevaluated.

The three propositions presented so far seek to describe some of the fundamental revisions military organizations must take into consideration in their strife for a more adaptive approach to organizational life. The propositions have most likely so far generated more questions than answers. With the view to addressing some of the answers to those questions, the next section will discuss specific propositions for a Complexity Approach in military organizations.

5.4.2 Specific propositions

The following propositions will be organized in the categories of doctrine, strategy, structure, control, policy making, planning and analysis and training. The aspects being discussed are highly interdisciplinary, so the reader is requested to see beyond the categories and link the propositions to the theory presented in chapter 3, 4 and 5.

5.4.2.1 Doctrine

Microsoft Encarta defines doctrine as *"a rule or principle that forms the basis of a belief, theory, or policy"* (Microsoft Encarta (17)). In a military setting a doctrine may be linked to a standardized set of operating, for instance a certain way of maneuvering, structuring the troops and the utilization of weapons. The trench warfare of the First World War, the Blitzkrieg of the Second World War or Shock and Awe from the United States invasion of Iraq in 2003 are all examples of military doctrines.

Proposition 2.1: *Doctrine must be a catalyst for inspiration rather than direction*

The first, and perhaps most obvious point, is that a doctrine must be explicit in its recognition of a Complexity Approach (Blakesley, 2005: 77). Implicit in this statement is the implementation of non-linear, holistic, interdependent and self-organizing principles.

Secondly, a doctrine should not be perceived as a dogma and static product (Calhoun, 2004: 71). Heterogeneous opinions and significant differences serve as catalysts for change and continuous organizational adaptation. In that sense, a doctrine must serve as a facilitator

where experimentation and novelty are highlighted, not fixed attractors such as “established” and dogmatic truths.

Thirdly and likewise implicit in the latter point, is that indoctrination might not serve the purpose of a doctrine based on Complexity Principles. Critical discussions around prevailing doctrines and the ability to think abstract are far more important qualities than the capacity to follow a certain set of rules. However, a military organization, as any other organization, must be balanced in terms of negative- and positive feedback, heterogeneity and homogeneity, and freedom and constraints.

Proposition 2.2: *Doctrinal innovation should be based on organizational and operational changes, not technological development.*

The Revolution in Military Affairs (RMA) is centered on the development and use of sophisticated technology. As previously discussed, this technology will generate increased amounts of information and does without doubt contribute positively to the effectiveness of military organizations, for instance through increased information sharing (Blakesley, 2005: 81). The major potential pitfall, however, is the danger of establishing doctrines on the assumption that technology is the panacea for military challenges. Historically, advances in technology have only served as a temporary advantage before the opponent finds creative ways of counter-acting that technology (Calhoun, 2004: 20).

Real doctrinal innovation comes through conceptual- or organizational changes. For instance, the German strategy of Blitz-Krieg in the Second World War did not rely heavily on superior technological advantages, but using the technology and their resources in a different way. The strategy adopted by Al-Qaeda relies surprisingly little on technology, but instead on a highly loose networked structure, indirect leadership and self-managed cells, all principles highly coherent with a Complexity Approach (Marion & Uhl-Bien (2004: 3-29).

Military organizations must thus acknowledge that technology only serves as a complement to assist doctrinal changes based on innovative conceptual- or organizational developments.

Proposition 2.3: *Simplicity rules*

A Complexity Approach teaches us that simple rules might create the basis for complex collective behaviour (Plowman et al, 2007: 350). In contrast to a Newtonian system which is governed by a high number of rules and imposed in a top-down fashion, a complex system may be governed by a small set of simple rules which serves as a gentle guiding principle for the emergent bottom up process.

In the development of doctrines military organizations should thus emphasize less detailed regulations and focus instead on the facilitation of bottom up processes. Doing less might, paradoxically, evidently lead to better innovation.

Proposition 2.4: *Doctrines should be widely distributed within the organization, but restricted to the external environment*

Due to amongst others democratic principles of transparency military organizations often make their doctrines public. The doctrine must be widely distributed within the organization for all familiarization at all levels. The external environment should, however, not have access to the doctrine as it would allow opponents to update their internal model and be better prepared for actions. Stated differently, a military organization's ability to impose novel surprise will increase when the opponent does not know what to expect.

A doctrine forms the foundation for the development of strategies, something the next section will discuss in light of a Complexity Approach.

5.4.2.2 Strategy

A strategy can be defined as "*a carefully devised plan of action to achieve a goal, or the art of developing or carrying out such a plan"* (Microsoft Encarta (18)). It might be expedient to point out the distinction between tactics and strategy as these are terms which are sometimes perceived to be the same. First and foremost, it may refer to different levels in the organization, where tactical level refers to the level in which combat is fought and strategic level refers to higher national- or international political level. Secondly, as strategy derives from the doctrine, tactics are often developed as a consequence of the chosen strategy. Hence, strategy refers to the overall conceptualization, while tactics refers to the conduct of an engagement.

Proposition 3.1: *Traditional war fighting strategies are ineffective in complex warfare*

Traditional warfare can be characterized as a large scale and linear conflict between two or more forces using conventional strategy (Bar-Yam, 2003: 19), for instance Operation Desert Storm in the Persian Gulf War. A complex warfare, on the other hand, is characterized by

small-scale and hidden enemy forces behaving in an unconventional way (Bar-Yam, 2003: 19).

There are many empirical examples supporting the proposition that traditional war fighting strategies are inefficient in a complex warfare setting. The Soviet invasion of Finland in the Winter War of 1939 for instance, serves as an example of how small scale forces operating on skies, eradicated two Soviet tank divisions with a clear disadvantage in manpower and firepower. The Vietnam War, the previous Soviet invasion and current U.S led invasion of Afghanistan serve as equally descriptive and relevant examples.

Thus, by implication, a military organization should have the capacity to fight both traditional and complex warfare, choosing a particular strategy as a result of what will be most beneficial in the d*e facto* situation and not based on pre-scribed policies on how they *should* fight.

Proposition 3.2: *Strategies should not necessarily emphasize synchronization and optimization*

Concepts of synchronization on the battlefield are deeply embedded in the Newtonian mechanistic metaphor. In order to obtain synchronization of manpower and firepower strong centralized control and command is needed. In a closed system without untimely friction synchronization is relatively easy and also perhaps desirable. Agents in complex systems on the other hand tend to behave in a highly unsynchronized fashion, all responding to its unique local conditions (Schmitt, 1999: 110). Synchronization in itself is not necessarily something bad. What is important here is the process which leads to synchronization. Synchronization that emerges due to local interaction between agents is clearly something different than a top-down imposed synchronization.

A Newtonian system will seek to optimize its performance towards a specific objective. The lessons of complexity, however, suggest that controlled optimization is difficult due to the high number of interconnected agents and the impossibility of predicting the future state of the system (Schmitt, 1999: 110). Instead, solutions must be grounded in local conditions. If they succeed, the system will distribute the solutions through its interconnected web itself and its attributes of self-organizational criticality (see chapter 3).

Proposition 3.3: *Destruction of the enemy is not necessarily the key to success*

A traditional perspective of warfare will often emphasize the importance of scale and the destruction of enemy forces. A “destructive” approach might, however, turn out to be

counterproductive in the long term taking the following issue into consideration. An annihilation of the enemies' structures will push their organizational system into chaos because the fixed attractors will not be able to keep the system in equilibrium. As earlier discussed it is when a system is operating in a far-from-equilibrium state that it is most sensitive to changes in initial conditions and displays spontaneous creativity, innovation and flexibility. Paradoxically, what may be perceived as a "conventional" victory, for instance the deceleration of victory made by former United States President George W. Bush in the US-Iraq war of 2003, may as the US-Iraq conflict strongly illustrates, turn out to be a long term loss as the enemy forces transform into a fine scale complex force who has simply adapted to the conventional forces' tactics and strategies (Bar-Yam, 2003: 25).

Hence, it may be necessary, all depending on the circumstances, to re-evaluate the long term effects of a destructive approach. It would most likely be in our interest to engage with an enemy who is in equilibrium, due to an increased level of linear behavior and as a consequence, increased predictability. Our strategy must thus constantly evaluate the option of keeping the enemy system in equilibrium by not interfering with the attractors (Blakesley, 2005: 76), as the system will be kept more stable and have less incentive to transform. This could mean, for instance, that the enemies' center of gravity (COG) remains unchanged and other, more peripheral capabilities are targeted.

This argument is also related to the strategy of reducing complexity of enemy structures. Assuming that complexity can be understood as the number of possibilities present in a system (Bar-Yam, 2003: 1), a "wide" and holistic strategy integrating economic, political, socio-cultural, environmental and technological factors should be prioritized instead of a scale-focus on casualties and firepower.

Proposition 3.4: *"irrational" and unpredictable behavior*

Military theorist Sun-Tzu argues that one should attack the enemy in his plan, and not necessarily in the field (Beckerman, 1999: 8). One approach might be to behave in a new and unexpected way that renders the opponent's plan inoperable. For instance, when the US Marines were deployed as the first US Forces in Vietnam they initiated operations after experiences from the Second World War. The Vietnamese Forces, however, behaved in an unconventional way with small and scattered forces which made the US Marines Tactics highly irrelevant and inefficient.

In order to behave irrationally and unpredictably organizations need to be tuned to the "edge of chaos" and display a high level of complexity within the organization (i.e. number of

opportunities available). An organization in equilibrium will search for answers within the existing structure and will not be able to create unpredictability for the enemy to the same extent as an organization operating at a far-from-equilibrium state. By stimulating bottom-up processes which generate novel, spontaneous and creative solutions, the enemy is left to react to our actions as exemplified in Boyd's now well known OODA-loop.

Doctrine and strategy are some of the most essential ramifications of any given organization. In order to support the principles defined in the doctrine and strategies, an organization needs a suitable structure. The next section will discuss some propositions for a Complexity Approach in light of structure and organization.

5.4.2.3 Structure

A structure refers to *"a system or organization made up of interrelated parts functioning as a whole"* (Microsoft Encarta (19)).

Proposition 4.1*: Conventional and unconventional structures are needed*

In the following discussion complexity is referred to *as "the measure of the number of possible ways a system can act"* (Bar-Yam, 2003: 6).

Military organizations must develop a capacity to solve both high complexity tasks and low complexity tasks, which again imply a need for both conventional- and unconventional structured forces (Bar-Yam, 2003: 6-7). A task with high complexity will not be suitable resolved by a low complexity system, but requires a high complexity system (Bar-Yam, 2003: 3).

A distinction can be made between high fine scale complexity forces and large scale forces. The first refers to capacities such as special operations, non-lethal forces, psychological warfare and humanitarian aid, while large scale forces refers to conventional combat units capacities such as infantry, cavalry and artillery. A system high in complexity, such as high fine scale complexity forces, is not adequately prepared to solve large scale force missions, while large scale forces are not suitably equipped to solve complex conflicts (Bar-Yam, 2003: 4).

A military organization is thus dependent on the incorporation of both conventional- and unconventional structures in order to effectuate the diverse sets of military conflicts it may face.

Proposition 4.2: *Formal hierarchies are less relevant for a Complexity Approach*

A classical perception of hierarchies often substantiates a negative view which is linked to the rigid and inflexible nature of these structures. From a semantic point of view one must, however, ask critical questions about the classical interpretation of hierarchies and their validity. Simon (1962: 468) describes hierarchy as a system consisting of *interrelated* subsystems, where each subsystem again is structured as a hierarchy until the system reaches its lowest level. A hierarchy from a classical perspective, however, focuses on the *authoritarian* representation of each hierarchy with less or no acknowledgement of the *interrelated* nature of such structures. For the purpose of clearly distinguishing between the two characterizations, the first will be labeled “informal” hierarchies and the latter “formal” hierarchies.

Simon (1962: 469) argues that informal hierarchies are a natural- and in fact an indispensable part of natural systems. Biological systems, for instance, consist of cells, which are organized into tissues, which are built into organs which evidently create systems. Informal hierarchies may also have a relatively flat structure, which is well reflected in a diamond’s structure where the carbon atoms as the first-order subsystem is *ad infinitum,* but still when broken down consists of electrons, protons and neutrons.

One may argue that the classical understanding of a formal hierarchy as static, authoritarian and inflexible is oversimplified and a result of a reductionist perspective (Cilliers, 2005: 138). A system is not merely a hierarchical system with clear and concise boundaries, if it were the system would be fully decomposable and as a result easy to comprehend (Cilliers, 2005: 138). Informal hierarchies (and the *de facto* life of formal hierarchies) are not well-structured, but consist of relationships across all levels of hierarchies and even between different hierarchies (Cilliers, 2001: 143).

At this point we may draw two conclusions. First of all, informal hierarchies are a natural part of all organizations, challenges occur however, when a formal hierarchy is defined as having boundaries that are too static or permanent. Secondly, the key to survival of a system lies in its ability to transform hierarchies according to the changing environment (Cilliers, 2001: 144).

In light of this, let us continue with a specific proposal regarding hierarchies and structure in a Complexity Approach.

Formal hierarchical command structures are not necessarily adequate for performing complex operations (Bar-Yam, 2003: 1, 8). Adams (2000: 1) takes a more radical stance when he claims that a Complexity Approach implies the destruction of the long-standing and traditional (formal) military hierarchy. As discussed on the latter proposal, a military organization depends on having a high level of complexity, i.e. number of available possibilities, as one single organizational structure is not adequate for responding to changing circumstances. The answer is thus twofold. A formal hierarchical command structure is most likely not a comprehensive approach in complex operations because the circumstances - to a larger degree - requires decentralized decision making. This does not, however, mean that a formal hierarchical command structure is not necessary in a military organization. It would also be of great value in a low complexity- and consequently more linear operation.

The main stream perception of military organization is, nonetheless, that formal hierarchies have a sufficiently strong foothold. Military organization should however acknowledge the need for- while simultaneously striving for a structure that allows and facilitates bottom-up approaches. While acknowledging that informal hierarchies are a natural part of the organization, genuine excellence starts with the simple which evolves to become the complex.

Proposition 4.3: *Network models may simulate complex systems*

Neural networks have the theoretical possibility to simulate a complex system (Cilliers, 2001: 145).

These models have the capability for self-organization and disperse the information throughout the system in a distributed fashion. Different structures, whether it is very loosely or rigidly organized, can be implemented into the same network (Cilliers, 2001: 144), so the flexibility and adaptability is clearly better than compared to a formal hierarchy. The network structure is thought to increase the information flow within the organization and thus create better information availability for decision makers at all levels.

Bar-Yam (2003: 15-19) distinguishes between two types of networks in warfare. The first is referred to as a distributed action system where the agents act highly independent and organizes spontaneously through local interaction. The essential element for achieving this collective “swarm-like” behavior is the use of simple rules as guiding principles, for instance

the use of live fire to coordinate movement and acts. The second type of network in warfare is a *"distributed control but coherent action system"* (Bar-Yam, 2003: 15). In contrast to the distributed action system which would be effective to use where multiple, and perhaps smaller, targets are to be conquered, the purpose of the coherent action system is to create concentration of strength to selected targets at any given time.

Neither of the two approaches can be characterized as *the one* optimal solution, but should be used depending on what is the most suitable for the given situation.

When this proposition was first presented, this dissertation posited that neural networks have the *theoretical* possibility needed to stimulate a complex system. The development of such networks will, however, be founded on the data which is *presented* to the network. This means that the boundaries of the system are defined by the given framework, and thus have a number of constraints which natural complex systems do not have. Thus, although networks have a number of properties of a natural complex system, they still have constraints which must be taken into consideration when interpreting the results (Cilliers, 2001: 145).

Proposition 4.4: *Structures have "fuzzy" boundaries*

In a formal hierarchy it is important to specify each component's boundaries so that lines of responsibility are clearly defined. Because a formal hierarchy is often grounded in an atomistic and closed-system perspective; these boundaries are confined so as to be within the organization and remain relatively narrow.

Stating that a military organization is a complex system implies an open-system perspective where first of all the relationships are more important than components, and secondly that the organization interacts with its external environment. The external (and internal) environment is in constant flux and it is thus difficult, if not impossible, to define its borders.

A forced definition of an organization's boundaries will inherently reinforce stability and weaken the resilience (Juarrero, 2007: 112-113). In other words the organization tends towards equilibrium. Hence, military organizations should pay less attention to defining and fixing its boundaries, but instead expend their energy acknowledging and adapting to their dynamic and changing nature.

Proposition 4.5: *Size does matter*

The end of the Cold War and the hegemonic position of the United States has brought a popular trend of "downsizing" and making the organization more effective and efficient (at least in Western nations' defenses) through market economy mechanisms such as New Public Management (NPM), regionalization and so forth. The effect of the subsequent reduction of personnel and units is in many cases thought to be counter-acted by integration of sophisticated technology and force multipliers.

This dissertation does not suggest that downsizing is *per se* something negative or bad, as it may well be suitable in many situations. One can argue however, that size does matter in complex systems taking the following into account. The primary characteristics of complex systems suggest that a high number of agents, interacting in a "rich" and dynamic way, are necessary for complexity to 'grow' (Cilliers, 1998: 3). A smaller number of agents will inherently mean that the preconditions for development of complexity are less favorable. The use of force multipliers and cutting edge technology might close the gap in linear terms by for example imposing greater and more effective firepower or a greater quantity of information, but it will not increase the number of *interactions* in a system and thus the preconditions for development of complex behavior.

One must also keep in mind that an adequate organizational size is closely connected to complexity, seen here as a *number of available solutions*. Or put differently, an adequate size is a prerequisite for an organization to hold a high number of available solutions. A military organization should have the capacity to "out variety" the enemy with a high number of available solutions, i.e. to hold a higher structural complexity.

Quadrennial Defense Review (QDR) presented by present US Ministry of Defense Robert Gates indicate a shift from unitary belief in technology as the primary source for success, but *quantity as an important quality*. The emphasis is on education and training to develop robust units that swift and effectively adapt to emerging threats (Daltveit et al, 2010: 19).

This dissertation argues that the structure in a Complexity Approach must amongst others be heterogeneous and favor adaptation and flexibility. While these principles are important in the development of adequate structures, it is equally relevant in other areas of the organization. The next section will discuss how a Complexity Approach could be manifested in the policy-, planning and analytical processes.

5.4.2.4 Policy making, planning and analysis

Policy making, planning- and analytical processes in Newtonian systems are often based on a quantitative methodology using rigorous, but sophisticated tools to come up with optimized solutions (Bankes, 2002: 1). Although these tools have provided organizations with new insight into policy- and planning processes, their application to complexity and adaptation is of questionable relevance.

A Complexity Approach teaches us that there are strong limitations on predictability in a complex system. While short term forecasting is possible, long term development emerges over time and is impossible to predict (Parker & Stacey, 1997: 41; Stacey, Griffin & Shaw 2000: 123-124; Stacey, 2006: 138).

Proposition 5.1: *Policy making and planning processes must facilitate adaptability and learning*

Based on the view of strong limitations on predictability this dissertation proposes a number of key principles on which policy making and planning processes should be based in order to achieve adaptability and learning.

Qualitative methodology: A discussed in chapter 3 qualitative methodologies offer a more comprehensive framework for understanding the principles of complexity than a quantitative framework. A qualitative approach favors possibility before probability and co-existence and non-linear interactions before causality and linearity (Roodt, 2007: 218). Hence, the traditional focus on static and fixed measurements should be interpreted in conjunction with a focus on emergent processes.

Novelty: Operating in new ways is far more important than maximizing existing solutions (Blakesley, 2006: 74). Policy makers and planners must be allowed, inspired and requested to explore the waters outside the aquarium and exploit irregularities in the environment and in the organization. Equally important, of course, is that the plans and policies must deny the enemy the possibility of adapting and developing.

A fundamental focus on novelty and creativity will increase the complexity of the organization (number of opportunities available), a prerequisite for responding adequately to changing circumstances.

Guidance: A detailed blueprint describing future events is most likely to be irrelevant and secondly it will inhibit bottom-up processes in the organization. Policies and plans should

offer guidance to the organization through simple, flexible and fundamental principles. For instance, the use of vision, values and ethics as guiding principles are far more flexible and dynamic than the use of rules, regulations and procedures.

Functional, not optimized: Optimized solutions will, due to its reliability on specific conditions, often turn out to be irrelevant. This does not mean that one should not strive to find good solutions. It merely means an alternating one's view concerning what can be characterized as a good solution as opposed to what might be omitted. The solutions should not be mislead by apparently disorder locally, as an order on higher level might emerge. As a consequence, the processes, the people involved and the final policies and plans must be highly flexible and allow for adaptation as the circumstances change.

Proposition 5.2: *Analysis must be increasingly holistic, pluralistic, systems' focused and process oriented*

Reality: The first and inherently fundamental aspect to discuss is the analysts' perception of reality. A traditional Newtonian perception is strictly positivistic and the reality is, or at least should be based on objective measurements, such as mathematical and logical language (Strand, 2007: 198). A Complexity Approach speaks for a reality where physical and non-material abstract phenomenon is equally important in the *co-evolution* of the presence (Wheatley, 1999: 50-52). An acknowledgement of the latter view has huge implications for the matter in which analysts gather and process information.

Pluralism: Due to the incompressibility of complex systems, one approach to analysis cannot represent an unambiguous analytical philosophy. Reliance on the use of formal models as the only approach will most likely result in highly standardized results. As the previous paragraph suggests, informal perspectives must be integrated in the analytical process together with formal models in order to create capacity for innovation and flexibility. A model should be considered as a tool for inspiration rather than a dogmatic tool for the revelation of absolute truth, which together with the integration of multiple informal perspectives and processes create a more holistic perspective (Richardson et al, 2000: 33-34).

A pluralist approach has not just relevance for the individual analyst. The organization must be structured in a way which facilitates the free flow of information, dialogue, discussions and critical thinking. The working teams should be loosely structured with a high level of heterogeneous actors (Kiel, 1994: 186-187).

System: The enemy must not be conceived of as the mere structure of the forces (for instance a division), but must be analyzed as a whole system where the patterns produced

are far more important than the isolated actions of individuals. The analysis must take into account multiple dimensions such as political, military, socio-cultural, economic, technological and environmental issues. Of course, these dimensions must not be treated as well-defined and isolated categories, but as interdependent and integrated within the system (Mebratu, 1998: 513-514).

This dissertation has so far presented a number of proposals relating to essential aspects of military organizations. The next and final section will discuss the element of training from the perspective of complexity.

5.4.2.5 Training

Training is an essential aspect in any organizational strategy (Grobler, Wärnich, Carrell, Elbert & Hatfield, 2006: 300). Training contributes with specific knowledge, attitudes or skills in the matter of a relatively short period of time (Rothwell & Sullivan, 2005: 33). Development, on the other hand, seeks to broaden individuals' knowledge base over a longer period of time through unconscious and conscious learning (Hodgetts & Kroeck, 1992: 372; Buckley & Caple, 2004: 7).

Proposition 6.1: *Humans are far more important than machines*

A system that consists of machines will merely constitute a simple or complicated system, while any system with human beings *can* be characterized as a complex system. A simple or complicated system may be highly effective when it comes to execution of specialized and "closed" tasks, but will never have the same potential for efficiency, creativity and innovation as a complex system.

In a complex environment the most important key for success is "*bounded" adaptive capacity*. Without the capacity for adaptation the system plunges into equilibrium or randomness, and may become irrelevant. Human beings possess a far greater capacity than machines to recognize patterns and adapt to sudden change (Blakesley, 2005: 81). This does not mean machines are irrelevant, it simply means that training must focus primarily on human beings as the most essential part of a military organization, and not machines.

Proposition 6.2: *Exercises must allow emergence*

A vast majority of the exercises in military organizations indicate that the content and development of the exercises are highly controlled. There are of course many reasons and

some of them good, for this approach. Some of the arguments may for instance be to optimize the training to get “more for less” or perhaps have a “controlled” development of the competencies. One might, however, ask critical questions as regards the legitimacy of these arguments seen from a Complexity Approach.

Exercises must be allowed to “grow” and emerge over time (Blakesley, 2005: 81). The reasons for this are multiple. First of all, loose boundaries will allow the battle to emerge naturally and thus create genuine situations. Secondly, the emergence and development of the enemy, and subsequently one’s own forces, will facilitate adaptation, something which is very difficult to make possible in a closed and fixed environment. Third and finally, it will enable officers (and soldiers) to see patterns emerge over time and enforce the development of intuition and adaptive learning.

This dissertation will now provide a summary of the most important findings of this chapter.

5.5 Summary

The purpose of this chapter was to investigate the implications a Complexity Approach in general military activity. The following research objective was articulated:

Research objective 3: *To investigate the implications a Complexity Approach in military organizations.*

The main findings of this chapter are linked to the different sub-objectives. These sub-objectives and the findings are listed below.

Research objective 4.1: To describe the current paradigm in military organizations.

The characterizations of the reigning paradigm in military organizations are closely linked to Newtonian Principles of linearity, reductionism, determinism and closed system’s thinking.

The quest for control, equilibrium and stability are central aspects that permeate every function of the military organization, whether it is battle, structure or doctrine. The high degree of formalization and top-down control mechanisms are linked to an autocratic and bureaucratic organizational structure.

In the search for solutions to military challenges many military organizations have adopted what can be labeled as the Revolution in Military Affairs (RMA). The core of this proposed

revolution is the notion of sophisticated technology being the panacea for challenges of increased complexity.

Research objective 4.2: To discuss if a Military organization can be characterized as a complex system.

Using the characteristics of a complex system as proposed by Cilliers (1998) this thesis concludes that any military organization can be labeled a complex system.

Research objective 4.3: To describe and discuss general Military implications of a Complexity Approach.

Ilachinski (1996) argues that a Complexity Approach is applicable to military organizations in a number of ways. It may affect the metaphors, policies, conventional models, combat technology, combat aids and conceptualization of war.

From a complexity point of view, war can be understood as a non-linear system with self-organizational and emergent properties. It is open, distributed, dynamic, and small changes to initial conditions might grow to big changes through positive feedback-loops. The notion of war being characterized as a clash between two billiard-balls is therefore substituted by a perception of war as an organic exchange of energy, matter and information.

Research objective 4.4: To describe and discuss propositions of a Complexity Approach in Military organizations.

Research objective 4.4.1: To describe and discuss general or principal propositions of a Complexity Approach in Military organizations

General propositions:

- Proposition 1.1: In order to adapt to a dynamic and constantly changing environment military organizations should incorporate Complexity Principles
- Proposition 1.2: A Complexity Approach should be applied to the whole organization
- Proposition 1.3: A Complexity Approach implies full-spectrum organizational change

Research objective 4.4.2: To describe and discuss specific propositions of a Complexity Approach in Military organizations

Doctrine

- Proposition 2.1: Doctrine must be a catalyst for inspiration rather than direction

- Proposition 2.2: Doctrinal innovation should be based on organizational and operational changes, not technological development.
- Proposition 2.3: Simplicity rules
- Proposition 2.4: Doctrines should be widely distributed within the organization, but restricted for the external environment

Strategy

- Proposition 3.1: Complex warfare cannot be won by using traditional war fighting strategies
- Proposition 3.2: Strategies should not emphasize synchronization and optimization
- Proposition 3.3: Destruction of the enemy is not necessarily the key to success
- Proposition 3.4: “Irrational” and unpredictable behavior

Structure

- Proposition 4.1: Conventional and unconventional structures are needed
- Proposition 4.2: Formal hierarchies are perhaps less relevant for a Complexity Approach, but not informal hierarchies
- Proposition 4.3: Network models may simulate complex systems
- Proposition 4.4: Structures have “fuzzy” boundaries
- Proposition 4.5: Size does matter

Policy making, planning and analysis

- Proposition 5.1: Policy making and planning processes must favor adaptability and learning
- Proposition 5.2: Analysis must be increasingly holistic, pluralistic, systems’ focused and process oriented

Training

- Proposition 6.1: Humans are far more important than machines
- Proposition 6.2: Exercises must allow emergence

At this point, this dissertation has attained the first three research objectives. A Complexity Approach has been described and discussed, the implications of this theory for leadership have been elaborated on and finally this chapter has investigated the military implications of a Complexity Approach. This dissertation will now continue with the empirical part of this study by presenting and discussing the results from the survey at the Joint Staff College.

Chapter 6: A Complexity Approach in a Military Leadership Environment: The Case of Norwegian Military Officers

The purpose of this chapter is to clarify the Norwegian Military Officers' relationship to Complexity and Newtonian Principles.

This chapter outlines the results from the survey carried out at the Norwegian Joint Staff College. This chapter is essential in order to meet research objective 4 which is formulated as follows:

Research objective 4: Based on an empirical survey, describe and analyze Norwegian Officers' worldview against the principles of a Complexity Approach and leadership in complex systems.

Research objective 5.1: To present the main trend from the survey and describe the organization of the presentation.

Research objective 5.2: To present the method of calculation.

Research objective 5.3: To present the sample description.

Research objective 5.4: To present and discuss data and trends supporting a Newtonian Approach.

Research objective 5.5: To present and discuss data and trends supporting a Complexity Approach.

Research objective 5.6: To present and discuss data and trends across demographic variables.

Research objective 5.7: To discuss gaps and anomalies.

Research objective 5.8: To compare the surveys conducted at the Joint Staff College and Norwegian Military Academy[16].

Research objective 5.9: To summarize the most important features of this chapter.

The first part of this chapter will describe the general framework of this survey by presenting the main trends, the method of calculation and sample description. Based on these elaborations this dissertation will then present and discuss particular Complexity Trends and

[16] Survey conducted at the Norwegian Military Academy by Rønn (2009) investigating the worldview of Norwegian Military Cadets in light of Complexity Theory.

Newtonian Trends. The trends will be articulated substantiated by a presentation of the relevant results and a short discussion linking the specific trends to the literature. This will be followed by a presentation and discussion of the results across relevant demographic variables. Thereafter a number of gaps and anomalies will be discussed using the survey's contradicting results as a point of departure with the view to gaining wider support for- and understanding of Norwegian Military Officers' attitudes towards Complexity and Newtonian Principles. This dissertation will compare the surveys conducted at the Joint Staff College and the Norwegian Military Academy respectively. Finally, the most important features of this chapter are summarized.

6.1 Norwegian Military Officers and Complexity Principles

This part of the dissertation comprises a presentation and discussion of the results from the survey carried out at the Joint Staff College using Military Officers attending the Staff Officer Course[17] and Masters Degree Study[18] as respondents.

Using descriptive statistics and summarizing the average values on each question reveal that the Norwegian Military Officers participating in this survey have a relatively balanced view towards Complexity and Newtonian Principles. As illustrated in figure 16, the majority of the respondents adhere towards Newtonian Principles when it comes to general Complexity and Newtonian Principles.

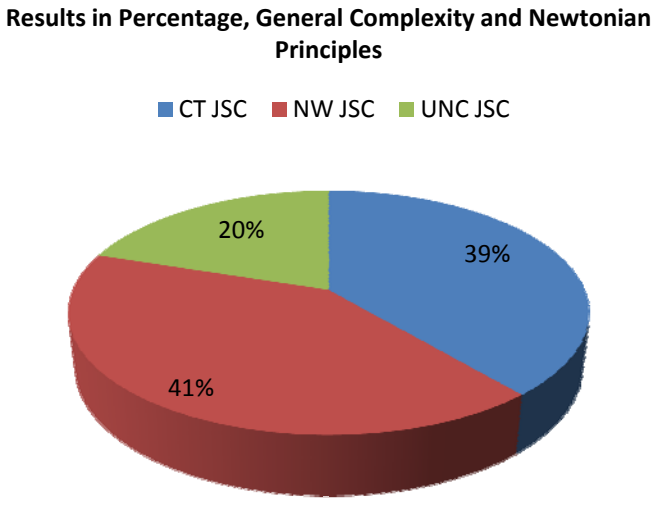


Figure 16 - Results in percentage, General Complexity and Newtonian Principles

[17] Norwegian "stabsstudie".
[18] Norwegian "masterstudie".

Results from the part of the survey which focuses on a Newtonian or Complexity Approach to leadership, however, discloses an opposite trend where Complexity Principles are markedly preferred compared to Newtonian Principles (figure 17).

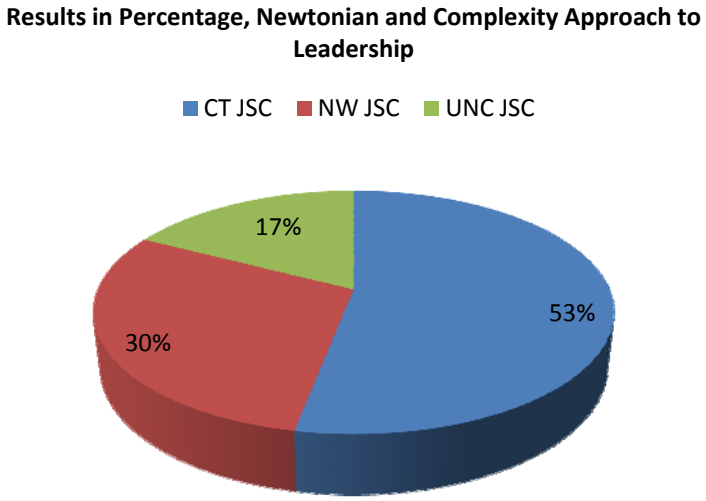


Figure 17 - Results in percentage, Newtonian and Complexity Approach to Leadership

Although these results may serve as an indicator of the overall and generalized trends, it is the elucidation of each question, factor and trend which is important in order to establish what worldview the participating Officers have.

The next section will describe the method in which the above mentioned trends are calculated.

6.2 Methodology

The method of calculation, general observations and sample description will now be presented.

Please also consult chapter 2, Research Design and Methodology.

6.2.1 Method of Calculation

In order to calculate the data from the survey this dissertation uses the computer software SPSS (Statistical Package for the Social Sciences) and descriptive statistics reporting frequencies for all respondents and across all demographic groups.

A five point Likert-scale is used, It presents two positive (strongly agree, agree), one neutral (uncertain) and two negative response alternatives (disagree, strongly disagree).

As described in chapter 2, Research Design and Methodology, the measuring instrument is built around specific factors identified and elaborated on by Rønn (2009). Each factor has two questions where one of the questions normally represents a Newtonian view of the given factor and the other question corresponds to a Complexity Approach. For instance, factor 2 (conflict) is represented by question 2 and 17 where one statement represents a Newtonian perspective related to the factor and the other a Complexity perspective.

Factor 2: Conflict	2	I *mostly* prefer working in a harmonious work team with little friction and disagreement.	CT Newt Uncertain	40.9 **44.3** 14.8	CT: 36.85 Newt: **46.75** Uncertain: 16.4
Factor 2: Conflict	17	I *mostly* think of conflicts within a group as something good.	CT Newt Uncertain	32.8 **49.2** 18.0	

Figure 18 - Example of calculation and presentation of data

In order to calculate the degree of adherence towards a Complexity Approach, Newtonian Approach and Uncertain respectively, the two positive response alternatives of *strongly agree* and *agree* on the one hand, and two negative response alternatives of *strongly disagree* and *disagree* on the other hand are integrated. What this means is that, in the case of question 2 (factor 2) 44.3% of the responses adhere towards a Newtonian Approach and 40.9% adhere towards a Complexity Approach (figure 18).

By using the same methodology on the connected question, in this case question 17, an average percentage on that specific factor for the categories of Complexity, Newtonian and Uncertain can be calculated. For instance, to calculate the average percentage of Newtonian adherence on factor 2 the Newtonian values on question 2 and 17 are added and then divided by the total value on the factor (44.3+49.2= 93.5/200 = 46.75) (figure 18).

There are some aspects of this kind of approach to calculation which needs further clarification.

First of all, the missing values are not included in the calculation. The fact that there are only two missing values in the survey, which must be looked upon as a negligible amount, makes it reasonable to conclude that the calculations are not much affected.

Secondly, calculating the average percentage on each factor may occasionally present a misleading picture taking into account that strong contradictory replies on each question might indicate a relatively balanced distribution between the different categories. For instance, in the case of 100% responses on a Complexity Approach on the first question and 100% responses for a Newtonian Approach on the second question of the factor will, when calculating the average percentage, present a balanced scoreboard. Hence, this dissertation will be cautious of using the average value as the sole source of information when reasoning unless supported by each connected question.

During the analysis component of the research study a number of general tendencies in the Officers' responses were observed that need special attention. These tendencies are discussed in the section that follows.

6.2.2 General Observations

The participants are relatively moderate in their feedback responding either *agree* or *disagree* and more seldom *strongly agree* or *strongly disagree*. The Officers do, however, take a pronounced stand on the statements themselves something which a relatively low response-rate of the neutral "uncertain" option indicates.

With the general information in mind, this dissertation will now describe the sample in terms of the level of education, age, rank, gender and background of the officer in question

6.2.3 Sample Description

The survey had a total of 61 participants from the Joint Staff College.

The respondents are distributed on two educational levels, the Staff Officer Course and Masters Degree Study with 77% and 23% of the respondents respectively (figure 20). Comparing to the total number of students attending these two educations, 84.7% of these students participated in the survey.

The average age of the participants was 40 years with the youngest respondent being 31 years and the oldest 48 years.

The respondents' ranks are Captain, Major or Lieutenant Colonel where Major is the largest segment. Based on the ranks it may be argued that the sample could be labelled as medium levelled leaders in the Norwegian Armed Forces.

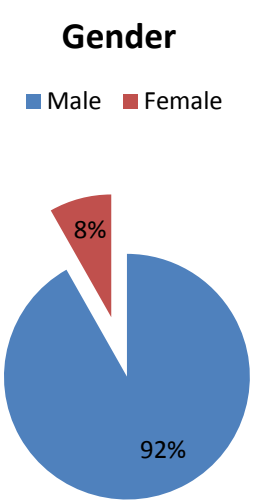


Figure 19 - Distribution on gender

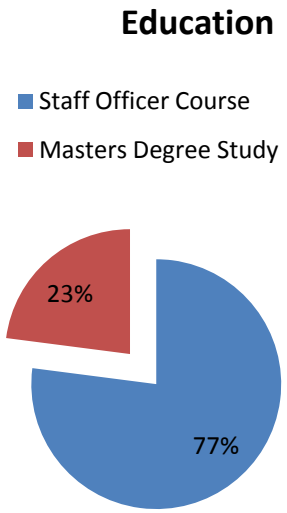


Figure 20 - Distribution on education

Male Officers strongly dominated the survey with 92.0% of the replies, in contrast to only 8.0% of replies coming from female Officers (figure 19), something which may be considered to be a representative ratio considering the gender distribution in the organization as a whole.

39.3% of the participants have a background in the Armed Forces, 26.2% Navy, 29.5% Air Force and 4.9% are Civilian (figure 21). Thus, it can be argued that the distribution of respondents on the different branches participating in this study is relatively even (with exception of the very small percentage of civilian respondents).

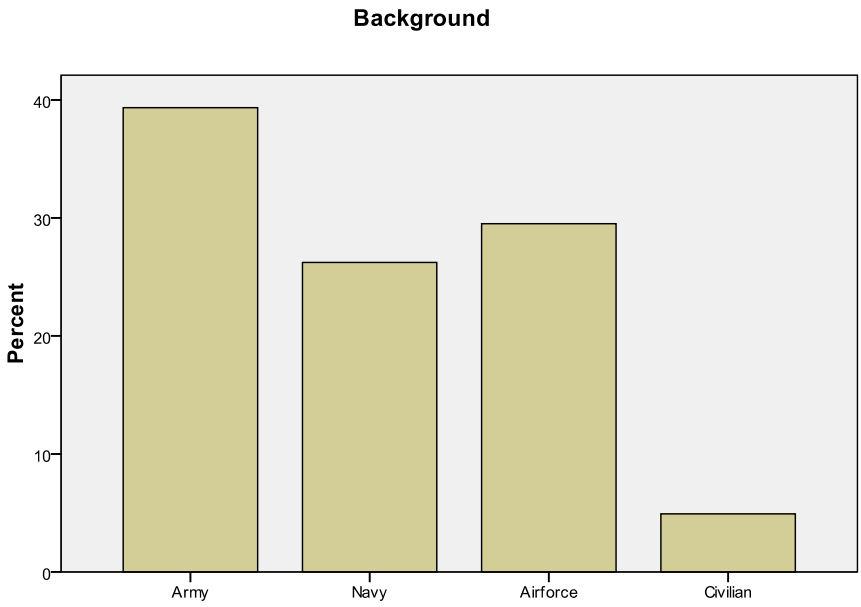


Figure 21 - Background

Having presented the characteristics of the sample it is now worthwhile discussing whether the sample is representative or not.

6.2.3.1 Representative sample

As presented and discussed in chapter 2, Research Design and Methodology, this dissertation made use of a non-probability sampling method which often is not a suitable sampling method in terms of creating a sample that is representative of the general population (Welman et al, 2005: 70; Gravetter & Forzano, 2003: 125-125; Mitchell & Jolley, 1998: 498).

The purpose of this research is, however, not to generalize in terms of the entire population, but rather to generalize for a selected segment, Norwegian Military Officers. The question concerning a representative sample is thus more connected to whether the given sample is representative in terms of the Norwegian Military Officers as a group or not.

In order to calculate the representativeness for the Norwegian Military Officers it is necessary to take the following into consideration. First of all, the number of participants compared to the total number of Officers in the Norwegian Armed Forces and secondly the distribution with regards to rank and whether this distribution is proportional compared to the *de facto* distribution of rank.

When approaching the Norwegian Armed Forces to collect the necessary data needed to calculate representativeness they were reluctant to hand out this information due to issues of confidentiality. Hence, it is not possible for this dissertation to calculate accurately the degree of representativeness.

Concerning the distribution on rank, the sample, which represents Captain, Major and Lieutenant Colonel, it is reasonable to conclude that it is not a representative sample for all ranks in the Norwegian Armed Forces.

It is however reasonable to conclude that the sample is representative for the middle level leaders of the branches of Army, Navy and Air Force taking the following into consideration:

- The 61 participants represent a relatively narrow segment in terms of rank (and thus a relatively small number).
- This segment of rank (mid-level) is normally a small group compared to lower level officers (and thus a relatively small number).

- The sample represents 84.7% of the students attending the Staff Officer Course and Masters Degree Study at the Joint Staff College. It is reasonable to conclude that the Joint Staff College provides a sufficient, comprehensive and representative amount of Officers to sustain the organization.

The integration of the results from the survey conducted at the Norwegian Military Academy (Army) by Rønn (2009), which will be described in summary later in this chapter, may increase the degree of representativeness to the Army specifically and the Armed Forces generally by including 117 respondents from lower level Officers (Second Lieutenants and First Lieutenants).

For the purpose of this presentation the term “Norwegian Military Officers” will be used although the sample is more representative for low- and middle level Officers.

Based on the information provided in this section, the next step for this dissertation is to investigate how the sample has responded.

6.3 Results and Discussion of Newtonian Trends

This part of the chapter sets out to clarify what Newtonian trends can be identified in the survey conducted at the Joint Staff College.

The presentation has integrated the responses from all the Officers which mean that all the demographic variables have been included.

In part one of the survey nine factors out of a total of 15 factors, or 60.0%, indicated a majority of Newtonian responses. 16 of the questions had a majority of Newtonian responses which represents a slight majority of the questions in the part investigating general Complexity and Newtonian Principles.

In part two examining the Officers’ relationship to a Complexity or Newtonian Approach to leadership five factors out of a total of 14 factors, or 35.7%, point towards a Newtonian Approach. Concerning number of questions, 8 out of 28 questions had a majority of responses in favour of the Newtonian worldview.

In order to elucidate the trends behind these numbers this dissertation will now undertake a description of the results supporting a Newtonian worldview. The description will initially present the results supporting the general Newtonian Principles succeeded by the factors

sustaining a Newtonian Approach to leadership. Based on these results this chapter will then identify specific Newtonian trends and discuss them in terms of the literature.

6.3.1 Results Supporting a Newtonian View

The presentation of the results are organized in two tables where the first (table 6) describes the results supporting general Newtonian Principles and the second (table 7) presents the results substantiating a Newtonian Approach to leadership.

The results are presented as per factor in ascending order where each connected question is presented. In some cases individual questions might indicate a majority of responses towards a Complexity Approach, but the average percentage on the factor supports a Newtonian Approach. The first is an indication that contradictions in the Officers' worldview do occur and that human attitudes can not necessarily be captured in the categories as it is presented in this thesis.

In order to identify more explicitly at what degree each factor supports a Newtonian Approach compared to a Complexity Approach, the difference between these two approaches are calculated and presented as a percentage difference[19]. A small percentage will indicate a relatively small difference between Newtonian and Complexity responses and thus a relatively small majority of the responses (but still the majority), while a big percentage will indicate a more clear adherence towards any of the two given approaches.

The description of the results supporting general Newtonian Principles will be now be presented (table 6).

Reference	Q	Statement	Indication	%	Average in %	Difference NW and CT in %
Factor 2: Conflict	2	I *mostly* prefer working in a harmonious work team with little friction and disagreement.	CT Newt Uncertain	40.9 **44.3** 14.8	CT: 36.85 Newt: **46.75**	11.9%
Factor 2: Conflict	17	I *mostly* think of conflicts within a group as something good.	CT Newt Uncertain	32.8 **49.2** 18.0	Uncertain: 16.4	

[19] CT average value+ Newtonian average value = total CT and Newtonian value. Difference between average Newtonian and CT value divided by the total CT and Newtonian value equals difference in percentage. For instance at factor 2 conflict the calculation will be as follows: 36.85+46.75= 83.6, 46.75-36.85 = 9.9, and 9.9/83.6 = 11.9.

Factor 3: Planning – Long term	3	Long term - and detailed planning is *usually* creating good results in an organization.	CT Newt Uncertain	14.8 **60.7** 24.6	CT: 36.9 Newt: **41.85** Uncertain: 21.3	6.3%
Factor 3: Planning – Long term	18	Detailed plans, policies and strategies *rarely* work out as they were intended to.	CT Newt Uncertain	**59.0** 23.0 18.0		
Factor 4: Forecasting - predictability	4	When I plan an operation or event I *usually* put much emphasis on trying to predict what will happen.	CT Newt Uncertain	21.3 **63.9** 14.8	CT: 31.15 Newt: **43.45** Uncertain: 25.45	16.5%
Factor 4: Forecasting - predictability	19	The assumptions one make of the future *often* turns out to be misleading.	CT Newt Uncertain	**41.0** 23.0 36.1		
Factor 6: Process-orientation	6	I believe that managing by objectives or goals *usually* is the best way to create success for my organization.	CT Newt Uncertain	8.2 **86.9** 4.9	CT: 13.95 Newt: **70.5** Uncertain: 15.55	66.9%
Factor 6: Process-orientation	21	I believe that a fundamental focus on processes instead of goals *usually* will be the best way to create success for my organization.	CT Newt Uncertain	19.7 **54.1** 26.2		
Factor 8: Chaos	8	I *usually* look at chaos in my organization as something negative and destructive.	CT Newt Uncertain	**45.9** 31.1 23.0	CT: 34.45 Newt: **41.8** Uncertain: 23.8	9.6%
Factor 8: Chaos	23	I *usually* look at stability and balance in my organization as something positive and constructive.	CT Newt Uncertain	23.0 **52.5** 24.6		
Factor 10: Causality and linearity	10	Small actions *usually* create small effects. In other words, if I do little I create little.	CT Newt Uncertain	**50.8** 23.0 26.2	CT: 36.05 Newt: **36.9** Uncertain: 27.05	1.2%
Factor 10: Causality and linearity	25	Great effort *usually* creates great effects.	CT Newt Uncertain	21.3 **50.8** 27.9		
Factor 12: Self-	12	I think that a team *usually* is dependent on having a leader to achieve success.	CT Newt Uncertain	8.2 **78.7** 13.1	CT: 10.65	75.0%

organization					Newt: **74.6**	
Factor 12: Self-organization	27	I think that a team in *many cases* can be more successful working without a formally appointed leader.	CT Newt Uncertain	13.1 **70.5** 16.4	Uncertain: 14.75	
Factor 14: Relationships	14	The *most important thing* in order to achieve success as a leader in my organization is to be relationship-oriented.	CT Newt Uncertain	**63.9** 16.4 19.7	CT: 38.5 Newt: **41.0**	3.1%
Factor 14: Relationships	29	The *most important thing* in order to achieve success as a leader in my organization is to be task-oriented.	CT Newt Uncertain	13.1 **65.6** 21.3	Uncertain: 20.5	
Factor 15: Rationality	15	When I make a decision I *usually* base it on a thorough analysis taking all relevant facts into account.	CT Newt Uncertain	21.3 **68.9** 9.8	CT: 31.15 Newt: **51.65**	24.8%
Factor 15: Rationality	30	I *usually* make spontaneous decisions based on intuition.	CT Newt Uncertain	**41.0** 34.4 24.6	Uncertain: 17.2	

Table 6 - Results supporting general Newtonian Principles

While the latter table presented results supporting general Newtonian Principles the next table (table 7) will present the factors substantiating a Newtonian Approach to leadership.

Reference	Q	Statement	Indication	%	Average in %	Difference NW and CT in %
Factor 17: Disrupt patterns	32	I think a leader should *often* create uncertainty and instability in the organization.	CT Newt Uncertain	3.3 **86.9** **9.8**	CT: 10.65 Newt: **73.8**	74.77%
Factor 17: Disrupt patterns	46	When I am leading a task I *usually* try to minimize uncertainty and instability in my organization and create harmony.	CT Newt Uncertain	18.0 **60.7** 21.3	Uncertain: 15.55	
Factor 21: system-centered leadership	36	As a leader I observe events and intervene with corrective directions when the events deviate from the plan.	CT Newt Uncertain	11.5 **70.5** 18.0	CT: 32.8 Newt: **44.25**	14.9%
Factor 21: system-centered leadership	50	I think that leadership is an expression of the collective behaviour of my organization where I, as a formally appointed leader am a *participant*.	CT Newt Uncertain	**54.1** 18.0 **27.9**	Uncertain: 22.95	
Factor 22:	37	In order to handle complex problems	CT Newt	6.6 **75.4**		5.0%

Building and mending relationships		military leaders *should* have their main focus on the micro-level interactions between people.	Uncertain	18.0	CT: 38.55 Newt: **42.6** Uncertain: 18.85	
Factor 22: Building and mending relationships	51	In order to handle complex problems military leaders *should* emphasize the use of complicated technical solutions.	CT Newt Uncertain	**70.5** 9.8 19.7		
Factor 23: Sense-making	38	The *most important* function of a top-level leader is to provide *purpose* for the organization through the use of inspirational and expressive language.	CT Newt Uncertain	**67.2** 9.8 23.0	CT: 35.25 Newt: **46.7** Uncertain: 18.05	14.0%
Factor 23: Sense-making	52	The *most important* function of a top-level leader is to articulate goals and provide good enough systems to reach the goals.	CT Newt Uncertain	3.3 **83.6** 13.1		
Factor 27: Focus on soft values	42	I believe the following group of metaphors best describe my leadership style: Gardener, steward, servant, missionary, facilitator and convener.	CT Newt Uncertain	31.1 **39.3** 29.5	CT: 23.75 Newt: **54.9** Uncertain: 18.3	39.6%
Factor 27: Focus on soft values	56	I believe the following group of metaphors best describe my leadership style: Leader, director, boss, father, problem-solver, doer, pathfinder, navigator.	CT Newt Uncertain	16.4 **70.5** 13.1		

Table 7 - Results supporting a Newtonian Approach to leadership

The presentation of the results reveals a number of factors adhering towards a Newtonian view. The next section will investigate and discuss the implications of these results in terms of specific trends that can be identified and how these trends are represented in the literature.

6.3.2 Identification of Newtonian Trends and Discussion

In order to distinguish between what can be considered strong or more modest results this thesis will use the following terminology correlating with the percentage difference between a Newtonian and Complexity Approach:

- Factors with an average percentage less than 10% of a difference between Newtonian and Complexity results will be labelled “majority”.
- Factors with an average percentage between 10% and 30% of a difference between Newtonian and Complexity responses will be labelled “moderate majority”.
- Factors with an average percentage above 30% of a difference between Newtonian and Complexity results will be labelled “strong majority”.

The trends are identified across the boundaries of “majority”, “moderate majority” and “strong majority”.

The different trends identified will now be presented and then discussed shortly in terms of the literature presented earlier.

Trend 1: A Complexity perception of conflict, chaos and disruption are perceived to be dysfunctional

A strong majority of the responses state that a leader should strive to minimize uncertainty and instability in the organization (question 46, factor 17) and likewise should not often create uncertainty and instability (question 32, factor 17).

The perception that a leader should not disrupt existing patterns (factor 17) is supported by a moderate majority of the responses stating an adherence towards a Newtonian perception of conflict as something negative (question 2 & 17, factor 2) and a majority interpreting chaos as less important than stability and balance (question 8 & 23, factor 8).

The Cadets’ view on conflict, chaos and disruption of existing patterns reveal a Newtonian trend. It is left to us now to look at how this view is presented in the literature.

Literature

In Complexity Theory chaos is interpreted as “*apparently random changes occur*[ing] *as a result of the system’s extreme sensitivity to small differences in initial conditions*” (Microsoft Encarta, 2008 (6)). One must thus distinguish between a traditional perception of chaos as random and anarchic on the one hand, and a complexity interpretation of chaos as apparent chaos with a hidden underlying structure on the other hand.

Ilya Prigogine and his theory of Dissipative Systems teaches us that chaos perceived as apparent disorder is an essential aspect of creating order (Parker & Stacey, 1997: 37). Order

in this context does not refer to stability in a traditional sense, but the system operating far-from-equilibrium. In other words (but perhaps a bit confusing), equilibrium is in a way perceived to be disorder and equivalent with stagnation and death (Cilliers, 1998: 4), and disequilibrium the source of renewal (Wheatley, 1999: 21).

Hence, in order to facilitate emergence leaders in complex systems should seek to disrupt existing patterns instead of creating stability and harmony (Plowman et al, 2007: 344; Parellada, 2007: 166; McKelvey, 2008: 3; Uhl-Bien, Russ & McKelvey, 2007: 311; Uys, 2002 41; Kiel, 1994: 204-205; Walker, 2006: 102-103). The disruption destabilizes the system and facilitates creativity and innovation by creating adaptive tension and incentives for the system to change (Uhl-Bien & Marion, 2009: 643, 645).

One of the approaches used to disrupt existing patterns is to create and surface conflict. Surfacing conflict and disharmony may promote diversity and heterogeneous thinking by highlighting points of distinction. Although it may facilitate creativity and innovation one must also keep in mind that conflict in many cases is connected to anxiety, confusion and uncertainty (Edvardsen, 2000: 269-270; Parker & Stacey, 1997: 64), something which might create big challenges for the organization (Simpson, 2006: 479).

This dissertation will now continue with the next trend identified.

Trend 2: The Officers are highly goal-oriented

A strong majority of the responses suggest that Officers are highly goal-oriented. 86.9% of the responses believe that managing by objectives or goals is *usually* the best way to create success in their organization (question 6, factor 6). In comparison, only 19.7% of the respondents believe that a fundamental focus on processes instead of goals will usually be the best way to create success in their organization (question 21, factor 6).

The Officers' emphasis on goal-orientation as the key to success is supported by 83.6% of the responses (question 52, factor 23) claiming that the most important function of a top-level leader is to articulate goals and provide good enough systems to reach the goals. The proposed trend is further substantiated by the Officers' perception (65.3%) that task-orientation is the most important aspect of achieving success as a leader in their organization (question 29, factor 14).

Literature

When discussing goal- versus process orientation it is necessary to distinguish between fixed- and strange attractors. From a Newtonian perspective, goals are important- and often fixed attractors serve as a method for guiding individual- and organizational behaviour. A goal is futuristic in the sense that a desired outcome is defined which in many cases is based on forecasting and assumption-making of future happenings. An implication of this perspective is that individuals and organizations exist to a large degree independently of the environment as a closed system (Juarerro, 2007: 110).

Strange attractors, as opposed to fixed attractors, are dynamic and in most cases unknown or difficult to identify clearly. These attractors emerge in the evolution of the apparently random system and might be referred to as multiple mobilizations points that due to non-linear dynamics may serve as a medium for reshaping the system (Dilworth, 1998: 497; Parker & Stacey, 1997: 97). For instance, the values or morals that emerge over time in an organization might serve as a strange attractor for reshaping of the system when the system tends towards random chaos or equilibrium (Wheatley, 1999: 132). Due to this fact, and perhaps more importantly, due to the fact that *relationships* and *interactions* are the key determiners of all things in a complex system (Wheatley, 1999: 34), a Complexity Approach speaks for process-orientation instead of goal-orientation as the main road to success. This does not mean however, that goal orientation *per se* cannot be useful or be the most appropriate approach in a number of situations (for instance short term goals are more relevant than long term goals due to the fact that it takes time for a complex system to amplify small changes).

The articulation of goals is in many cases based on predictions of the future and is supported by long term plans and strategies. This view forms the basis of the presentation and discussion in the following section.

Trend 3: The Officers believe that rational mechanisms such as long term planning and prediction are crucial in order to achieve success

A modest majority of the responses support the view of the Officers relying on a strictly rational approach. 68.9% of responses on question 15 or the average value of 51.65% on factor 15 support the notion of rationality, in this case described as basing their decisions on a thorough analysis taking all relevant facts into account. The rational approach to decision-

making may also be linked to the Officers' perception (52.6%) of holism where the whole is interpreted to be the sum of its parts (question 7, factor 7).

A rational approach will be dependent in many cases on making assumptions of the future. A modest majority of the responses support the Newtonian perception of predictability and forecasting as an essential part of creating success. 63.9% of the responses on question 4 or the average value of 43.45% on factor 4 indicate that the Officers usually put much emphasis on trying to predict what will happen when planning an operation or event.

A closely connected factor to rationality and forecasting is the notion of long term planning. A majority of the responses on factor 3 suggest that the Officers perceive long term- and detailed planning as crucial to create organizational success. For instance, 60.7% of the responses state that long term – and detailed planning usually creates favourable results in an organization (question 3, factor 3).

These results may be linked to the literature as follows.

Literature

A rational approach has, amongst others, three main implications that are relevant for this discussion. First of all, a rational approach suggests reason and logic over emotions and intuition, thus by implication restricting reality to something objective and physical. A Complexity understanding of reality does on the other hand integrate the Heisenberg Uncertainty Principle which propagates a subjective understanding of reality consisting of both immaterial and material aspects (Wheatley, 1999: 50-52; Cloete, 2006: 468).

Secondly, a rational approach substantiated by forecasting and long term planning speaks for a relatively linear and deterministic organizational view (Galbraith, 2004: 14). Keeping in mind how complex systems are highly sensitive to initial conditions, small changes might cause great effects through positive feedback loops (Parker & Stacey, 1997: 13). To rest long term plans on future assumptions is thus of questionable relevance in complex systems due to the impossibility of mapping all variables, interactions, interdependencies and subsequently outcomes.

Short term developments are *possible* to predict as opposed to long term developments, (but not with certainty) due to the fact that generation of non-linear actions from small changes in the initial conditions takes a relatively long time (Parker & Stacey, 1997: 41). Hence, short term planning has relevance in a complex system, but long term development emerges over time and cannot be predicted.

The third implication of rational thinking is linked to an atomistic understanding of reality where the whole can be understood by analyzing its parts (Cilliers, 1998: 456). From this it follows that the interaction - and by implication the interdependence – between the parts are not taken into account (Juarrero, 2007: 110).

This dissertation will now turn to the next and final identified Newtonian trend, namely the Officers relationship to self-organization, systems' leadership and "hard" leadership style.

Trend 4: The Officers believe in leadership dependence, person-oriented leadership and (a traditional) "hard" leadership style

A strong majority of the responses (average 74.6%) support a Newtonian perception of self-organization as it is described in the survey (factor 12). 78.7% of the responses think that a team is usually dependent upon having a leader in order to achieve success (question 12, factor 12), while only 13.1% believe that a team in many cases can be more successful working without a formally appointed leader (question 27, factor 12).

The principles of self-organization are closely connected to a systemic and participative perspective of leadership. 70.5% of the responses, however, support a Newtonian view where the leader is perceived to stand outside the processes observing events and intervening with corrective directions when the events deviate from the plan (question 36, factor 21). A modest majority on factor 21 (system-centered leadership) support a person-centered approach to leadership compared to a collective and systemic perspective of leadership, although a majority of the responses on question 50 (factor 21) substantiate a participative and collective approach to leadership. This question does, however, have a relatively high uncertainty percentage and must therefore be used with caution.

The first two paragraphs indicate leadership dependence (in a traditional sense) and a person-centered leadership approach. This statement is further substantiated by the Officers when asked about preferences in terms of leadership role metaphors where a strong majority of the responses support a "hard" leadership style. 70.5% of the responses believe that metaphors such as "leader, director, boss, father, problem-solver, doer, pathfinder, and navigator" are suitable to describe their leadership style (question 56, factor 27), while 31.1% of the responses believe metaphors such as "gardener, steward, servant, missionary, facilitator and convener" are the best way of characterizing their leadership style. The trend of a "hard" leadership style is in many cases linked to a direct execution of leadership, which 86.9% of the responses support when stating that leadership is directly in essence linked to

how one behaves, what one says and what one does in front of one's subordinates (question 39, factor 24[20]).

Literature

Cilliers (1999:90) describes self-organization as *"the capacity for self-organization* [which is also] *a property of complex systems which enables them to develop or change internal structure spontaneously and adaptively in order to cope with, or manipulate, their environment".*

From this it follows that self-organization is a bottom-up approach that emerges based on local interaction between interdependent agents. In other words, agents co-exist with each other and the environment (Kiel, 1994: 192).

From a leadership perspective a self-organizational perspective has a number of implications. First of all, the role and work of the leaders arises as a result of an emerging process based on a dynamic interaction between human beings and the environment Simpson, 2006: 479). Thus, the leader is *participating* in the ongoing emergence (Walker, 2006: 108), not observing events and intervening when the actions deviate from the plan. Leadership must focus primarily on supporting emergence by facilitating the indirect and catalytic processes within the organization (Schneider & Somers, 2006: 357).

Secondly, leadership has both individual and systemic perspectives. Individual perspective refers to the actions taken by individuals to support emergence, while the systemic perspective represents leadership as a metaphor of the collective behaviour of the system that emerges through local interaction (Uhl-Bien, Marion & McKelvey, 2007: 306-307; Stacey, 2005: 106; Taylor, 2005: 148; Marion & Uhl-Bien, 2004: 29).

The literature of Complexity Theory suggests the importance of a "soft approach" to leadership instead of the traditional "hard" management tools (Wheatley, 1999: 57; Falconer, 2007: 137; Fairholm, 2003: 375-380). Soft value oriented leadership behaviour such as listening, coaching, empowering, and inspiring is considered to be crucial in the process of facilitating emergence (Falconer, 2007: 137; Fairholm, 2003: 375-380). Emphasis on soft values also highlights the fact that emotional intelligence and human capital is far more

[20] The Officers do, however, respond very contradicting on factor 24 (question 53) supporting an indirect approach to leadership based on the belief that for instance empowerment and facilitation are the essence of leadership. Hence, this thesis does not include a direct nor indirect leadership approach as one of the main trends.

important than technical intelligence- and capacity (Martin, 2007: 7; Darwin, 2001, 482; Karp & Helgø, 2007: 35). The primary object for a leader in a complex system is thus to *make things possible* through facilitation instead of *making it happen* through top-down mechanisms (Plowman et al, 2007: 354; Keene, 2000: 16-18; Fairholm, 2004: 375-380; Johnson, 2001: 226; Parellada, 2007:16).

The results presented in this part of the chapter have substantiated the articulation of specific Newtonian trends. There are, however, results with a Newtonian majority of the responses that have not been presented due to either lack of clear results or irrelevance.

6.3.3 Additional Findings

A natural aspect of individual- and organizational life is how to respond to complexity. From a Newtonian perspective, “hard” approaches such as complicated and technical solutions are emphasized, while a Complexity Approach stresses that the main focus should be on micro-level interaction between people.

The Officers do not agree with either of these views as only 6.6% support the view where a military leader should have his/her main focus on the micro-level interactions between people when handling complex problems (question 37, factor 22) and only 9.8% substantiate the perception that complex problems should be solved by the use of complicated and technical solutions (question 51, factor 22).

When asked about causality and linearity (factor 10) there is only a difference of 1.2% between the Newtonian and Complexity responses. It is thus difficult, and perhaps wrong, to establish a specific trend in either the direction of Newtonian or Complexity. 50.8% of the responses support respectively a Newtonian and Complexity Approach on question 10 and 25 (factor 10), revealing a balanced average percentage and at the same time highly contradicting replies.

This dissertation will now continue to present and discuss the results and trends tending towards a Complexity Approach.

6.4 Results and Discussion of Complexity Trends

This part of the chapter aims at clarifying the Officers’ attitudes towards general Complexity Principles and a Complexity Approach to leadership.

In part one investigating which investigates general Complexity and Newtonian Principles six factors out of a total of 15 factors, or 40.0% indicated a majority of Complexity responses. 14 of the questions had a majority of Complexity responses which represents a slight minority compared to the Newtonian responses in this part.

In part two which examines the Officers' relationship to a Complexity or Newtonian Approach to leadership nine factors out of a total of 14 factors, or 64.3%, pointed towards a Complexity Approach. 20 questions out of 28 questions had a majority of Complexity responses revealing a relatively strong Complexity trend in this part of the survey.

This main trend does not, as indicated in the previous section, offer an understanding of the percentages. The results of each question and factor will provide a more comprehensive picture, something the next section will expound upon.

6.4.1 Results supporting a Complexity Approach

The presentation of the results is organized into two tables where the first (table 8) describes the results supporting general Complexity Principles and the second (table 9) presents the results substantiating a Complexity Approach to leadership.

The results are presented in the same manner as those under the Newtonian results.

Reference	***Q***	***Statement***	**Indication**	**%**	**Average in %**	**Difference NW and CT in %**
Factor 1: Heterogeneous agents	1	I *usually* prefer working in groups consisting of many different personalities and cultures.	CT Newt Uncertain	**68.9** 23.0 8.2	CT: **48.4** Newt: 36.1 Uncertain: 15.6	14.6%
Factor 1: Heterogeneous agents	16	It is *usually* not beneficial for a group to have a heterogeneous composition.	CT Newt Uncertain	27.9 **49.2** 23.0		
Factor 5: Qualitative methodology	5	To create an understanding of something I often only need to be given the statistics, objective figures and concrete facts.	CT Newt Uncertain	36.8 **39.3** 24.6	CT: **49.55** Newt: 32.75	20.4%
	20		CT	**62.3**		

Factor 5: Qualitative methodology		My experience is that statistics, facts and figures alone *rarely* give the necessary input to create an understanding of something.	Newt Uncertain	26.2 11.5	Uncertain: 18.05	
Factor 7: Holism	7	When I am analyzing a problem the best thing is to split the problem into smaller problems and solve each one of them independently. In other words, the whole = part+part+part etc.	CT Newt Uncertain	29.5 **52.5** 18.0	CT: **42.6** Newt: 38.55 Uncertain: 18.85	5.0%
Factor 7: Holism	22	I believe that splitting a problem into smaller problems and then analyzing them separately will create inaccurate results. In other words, the whole is greater than the sum of its parts.	CT Newt Uncertain	**55.7** 24.6 19.7		
Factor 9: Change	9	*Constant* change is *always* necessary for an organization to survive.	CT Newt Uncertain	**49.2** 27.8 23.0	Changed CT: **40.95** Newt: 33.55 Uncertain: 25.45	10.2%
Factor 9: Change	24	Constant change in the organization is *often* not necessary and has more negative effects than positive.	CT Newt Uncertain	32.7 **39.3** 27.9		
Factor 11: Control	11	When I am leading my unit, *my most important* goal is to create or maintain control.	CT Newt Uncertain	**54.1** 27.9 18.0	CT: **61.5** Newt: 18.5 Uncertain: 20.5	53.75%
Factor 11: Control	26	When I am leading my unit, *my most important goal* is to create freedom of action, flexibility and independence for my subordinates.	CT Newt Uncertain	**68.9** 8.2 23.0		
Factor 13: Open systems	13	I believe that my organization is very much affected by external events and that it needs to constantly *adapt* to changing circumstances.	CT Newt Uncertain	**82.0** 6.6 11.5	CT: **69.7** Newt: 10.7 Uncertain: 19.7	73.4%
Factor 13: Open systems	28	I believe my organization *in most cases* should stick to the defined plans and strategies.	CT Newt Uncertain	**57.4** 14.8 27.9		

Table 8 - Results supporting general Complexity Principles

The first table reflects the results supporting general Complexity Principles. The following table (table 9) presents the factors with the majority responses in favour of a Complexity Approach to leadership.

Reference	Q	Statement	Indication	%	Average in %	Difference NW and CT in %
Factor 16: Emotional intelligence	31	Having insight and understanding of the people one lead and cooperate with is *the most important feature* of military leadership.	CT Newt Uncertain	**85.2** 6.6 8.2	CT: **68.0** Newt: 15.6 Uncertain: 16.4	62.7%
Factor 16: Emotional intelligence	45	Having insight and understanding of the technical system one operate (e.g. a weapon's system, a platoon) is *the most important* feature of military leadership.	CT Newt Uncertain	**50.8** 24.6 24.6		
Factor 18: Encourage novelty	33	I think that innovation and creative thinking *usually* is the task of the leader, not the subordinates.	CT Newt Uncertain	**86.9** 8.2 4.9	CT: **86.9** Newt: 5.75 Uncertain: 7.35	87.6%
Factor 18: Encourage novelty	47	Instead of being the centre for innovation and creativity, a leader should *usually* prioritize to facilitate and encourage innovation among its subordinates.	CT Newt Uncertain	**86.9** 3.3 9.8		
Factor 19: Informal leaders	34	Military leaders get their power through the formal structure of the organization	CT Newt Uncertain	**57.4** 21.3 21.3	CT: **70.5** Newt: 14.75 Uncertain: 14.75	65.4%
Factor 19: Informal leaders	48	Military leaders get their power as a result of being recognized as a leader by the organization's members through the everyday interaction.	CT Newt Uncertain	**83.6** 8.2 8.2		
Factor 20: Decentralization	35	I believe that a decentralization of control and responsibility *often* create poorer results.	CT Newt Uncertain	**90.2** 4.9 4.9	CT: **82.75** Newt: 4.9 Uncertain: 12.3	88.8%
Factor 20: Decentralization	49	A believe that a centralization of control and responsibility *often* create better results.	CT Newt Uncertain	**75.3** 4.9 19.7		
Factor 24:	39	For me, leadership is *in essence* directly	CT Newt	6.6 **86.9**		7.0%

Indirect leadership		linked to how I behave and what I say in front of my subordinates. In other words, my actions guide my subordinates' behaviour.	Uncertain	6.6	CT: **50.00** Newt: 43.45 Uncertain: 6.6 Very contradicting answers	
Factor 24: Indirect leadership	53	For me, leadership is *essentially* about making it possible for sub-units or subordinates to solve their mission, for example through empowerment and facilitation.	CT Newt Uncertain	**93.4** 0.0 6.6		
Factor 25: Vision and values as guiding principles	40	A shared vision and strong organizational values are the *most important* guiding principles to create success in my organization	CT Newt Uncertain	**67.2** 8.2 24.6	CT: **55.75** Newt: 15.6 Uncertain: 28.7	56.3%
Factor 25: Vision and values as guiding principles	54	Well planned policies and regulations are the *most important* guiding principles to create success in my organization.	CT Newt Uncertain	**44.3** 23.0 32.8		
Factor 26: Anxiety	41	I accept that processes within my organization create anxiety among the employees.	CT Newt Uncertain	**44.3** 31.2 24.6	CT: **47.55** Newt: 27.9 Uncertain: 24.6	26.0%
Factor 26: Anxiety	55	If processes generate much anxiety in an organization, it is not worth it.	CT Newt Uncertain	**50.8** 24.6 24.6		
Factor 28: Unpredictable and boundary less system	43	In order to manage uncertainty and unpredictable situations military leaders should *always* focus on developing the ability to *constantly* adapt.	CT Newt Uncertain	**86.9** 3.3 9.8	CT: **77.9** Newt: 13.1 Uncertain: 15.55	71.2%
Factor 28: Unpredictable and boundary less system	57	In order to manage uncertainty and unpredictable situations military leaders should focus on detailed planning and automatic responses.	CT Newt Uncertain	**68.9** 9.8 21.3		
Factor 29: Leadership is something intangible and abstract	44	I believe the ability to think abstract and "outside the box" is the *most important* trait of a military leader.	CT Newt Uncertain	**57.4** 21.3 21.3	CT: **62.3** Newt: 17.2 Uncertain: 20.5	56.8%
Factor 29: Leadership is something	58	I believe that the *most important* leadership trait is the ability to follow procedures to solve a mission within the given resource	CT Newt Uncertain	**67.2** 13.1 19.7		

intangible and abstract		framework.				

Table 9 - Results supporting a Complexity Approach to leadership

Based on the results obtained it is now left to us to identify specific trends and discuss them in terms of the literature.

6.4.2 Identification of Complexity Trends and Discussion

Based on the results presented above this dissertation has identified specific Complexity trends which will now be articulated and discussed in terms of the literature.

Trend 5: The unpredictability and uncertainty of the Armed Force's milieu necessitates adaptation

A large majority of the responses indicate that the Armed Forces are characterized by an open system (factor 13). 82.0% of the responses believe that their organization is greatly affected by external events and that it needs to constantly adapt to changing circumstances (question 13, factor 13). On the contrary a mere 14.8% believe that their organization in most cases should stick to the defined plans and strategies (question 28, factor 13).

These findings are further substantiated by a large majority supporting the notion that in order to manage uncertainty and unpredictable situations military leaders should always focus on developing the ability to constantly adapt instead of depending on detailed planning and automatic responses as the main reaction to adaptive challenges (question 43 & 57, factor 28).

Adaptation necessarily means that creativity and innovation is a far more important leadership trait than the ability to follow procedures. A large majority support this view, stating more precisely that the ability to think abstract and "outside the box" is a far more important leadership trait than the ability to follow procedures to solve a mission within the given resource framework (question 44 & 58, factor 29).

This view is closely connected to a qualitative approach to methodology (factor 5), an approach in which a moderate majority of the responses support. An average percentage of 49.55% support a qualitative approach by for instance stating that statistics, facts and figures alone *rarely* give the necessary input to create an understanding of something (62.3% on question 20), while 39.3% support a Newtonian and quantitative perception of methodology

stating that in order to create an understanding of something one often only needs to be given the statistics, objective figures and concrete facts (question 5).

The trends presented in this section have revealed an adherence towards important Complexity Principles such as adaptability and abstract thinking. In the next section we investigate the link that these principles and responses have with the literature.

Literature

A complex system is an open system. It constantly interacts with its environment in a symbiotic way (Cilliers, 1998: 4). The opposite can be characterized as a simple or complicated system which is interpreted as existing outside its environment. In other words, it is a closed system which to a small extent is affected by external events.

A logical consequence of characterizing a complex system as an open system is a high level of unpredictability and uncertainty. These consequences are linked to the non-linear and emergent properties of a complex system which mean that small changes in initial conditions might grow to big effects through positive feedback loops (Wheatley, 1999: 121; Praught, 2002: 517; Casti, 1994: 95).

In order to respond adequately to these changing circumstances organizations should develop their capacity for adaptation instead of trying to control emerging events (Uhl-Bien et al, 2007: 299, 305-308, 314). From this it follows that detailed plans and regulations based on predictions of future events often have little value from a long term perspective.

The ability to think abstract and “outside the box” are important for generating creative responses to environmental fluctuations (Kiel, 1994: 186-187). The ability to think abstract is closely connected to an expanded awareness of the intangible and interconnected aspects of reality, and not just objective, measureable and physical properties which often constitute a traditional perception of reality (Wheatley, 1999: 50-52).

A quantitative approach to methodology, which will often emphasize principles such as objectivity, logic and rationality, are linked a perception of reality as something tangible, concrete and objective. A quantitative approach may be highly suitable for simple or complicated systems, but unless the quantitative model is as complex as the system itself, the picture produced is not accurate (Cilliers, 1999: 24). The incompressibility and intangibility, abstract and subjective aspects of any complex system can only be covered by a qualitative framework which allows emergence, non-linearity and constant evolvement (Roodt, 2007: 218).

In order to successfully adapt to an unpredictable and uncertain environment a positive relationship to decentralization and change is necessary, something the next trend highlights.

Trend 6: Decentralization and change is perceived to be something positive

A strong and moderate majority of the responses have a positive relationship to decentralization and change respectively (factor 20 & factor 11).

Only 4.9% of the responses indicate a belief that decentralization of control and responsibility often creates poorer results (question 35, factor 20). Simultaneously a mere 4.9% believe that a centralization of control and reasonability often creates better results (question 49, factor 20). The Officers' positive perception of decentralization is also substantiated by the Officers' relationship to control. Only 27.9% of the responses support a statement describing creating or maintaining control as their most important goal when leading their unit (question 11, factor 11), with 68.9% of the responses stating that their most important goal when leading their unit is to create freedom of action, flexibility and independence for their subordinates (question 26, factor 11).

Almost half of the responses support the statement where constant change is always necessary in order for the organization to survive (question 9, factor 9), although a relative majority (but considerable lower than question 9) of Newtonian responses on this particular factor also state that constant change is not necessary and has more negative than positive effects (question 24, factor 9). The average value does, however, favour a Complexity perception of change.

Let us yet again consult the literature on how these results relate to a Complexity Approach.

Literature

A centralized- and often authoritarian system will, from a Complexity perspective, often be too rigid to adapt successfully to unpredictable and uncertain circumstances. In order to stimulate the system to remain in equilibrium a lot of power manifested as rules, protocols and procedures are forced upon the system (Collier, 2007: 89), evidently creating so many artificial boundaries and resulting in an inability to react to fluctuations in the environment (Edvardsen, 2000: 273).

A decentralization of control as it relates to the whole system will evidently create a better basis for adaptation (Cilliers, 1998: 110). This statement can be supported by two primary reasons. First of all, a dispersion of control to all agents inherently creates better system

resilience (Collier, 2007: 89) and secondly less power mechanisms in place facilitate emergence and self-organizational behaviour.

Change is a prerequisite for the survival of a complex system in the way that equilibrium is equivalent with stagnation and subsequently death (Cilliers, 1998: 4). Change stimulates the system to operate in a far-from-equilibrium state of mind between the *"linearly determined order and indeterminate chaos"* (Waldrop, 1992).

This thesis will now continue describing the next trend identified.

Trend 6: The Officers perceive themselves to be informal leaders that encourage novelty

A strong majority of the responses believe that military leaders are informal leaders (factor 19). Only 21.3% of the responses indicate that military leaders obtain their power through the formal structure of the organization (question 34, factor 19), while as much as 83.6% support a view where military leaders get their power as a result of being recognized as a leader by the organization's members through everyday interaction (question 48, factor 19).

The results from the survey further indicate that a strong majority of the Officers prioritize in order to facilitate and encourage innovation among its subordinates instead of considering novelty to be the task of the leader (question 33 & 47, factor 18). This view is substantiated by the Officers' relationship to guiding principles where only 23.0% of the responses support a top-down approach defined as well planned policies and regulations as the most important guiding principles to create success in their organization (question 54, factor 25), but instead embrace a shared vision and strong organizational values as the most important guiding principles for creating success (67.2% on question 40, factor 25).

Encouraging novelty is also closely linked to the Officers' positive perception of heterogeneous agents, a perception in which a moderate majority of the responses support (factor 1).

Literature

The essence in a Complexity Approach to leadership is connected to the social process of dynamic and constant interaction between human beings and the environment (Griffin, 2005: 29). The function of a leader is thus loosely linked to the formalized power that may come with certain positions, but instead the leader and the role of the leader emerge as a result of the continuing and dynamic process of human relating (Stacey, 2005: 10; Tobin, 2005: 86-87; Taylor, 2005: 141).

The notion of non-linear dynamics and bottom-up processes supports the statement that freedom of action must be present on as low an aggregation level as possible (Baets, 2007: 108). From this it follows that leadership in complex systems should focus on facilitation of these processes by allowing for instance experiments and fluctuations, encouraging rich interaction and support of collective action instead of directing or designing them (Lichtenstein et al, 2009: 622-624).

From a Complexity perspective vision and values are described as evolutionary processes that emerge within the organization (Osborn & Hunt, 2007: 329, 332). Vision or values are thus nothing leaders or anyone else can *create* independently, but must be referred to as something which emerges over time due to interaction (Stacey & Griffin, 2005: 106, 116-117, 121-122). The emerging vision and values may act as a strong reference signal both in terms of positive and negative feedback for the system, guiding that system to work within the sphere of indeterminate chaos and determinate order.

The emerging vision and values are far more *resilient*[21] than any fixed or narrowly defined objective and offers genuine guidance as it is a result of the interaction between the participants, not the product of a single person or an elitist group. Another aspect, which may be considered to be even more important than the vision itself, is the *interdependence* that develops due to interaction in the emergent processes (Uhl-Bien & Marion, 2009: 642).

Heterogeneous agents are indispensable in a complex system as disequilibrium is a pre-requisite for emergence (Lichtenstein et al, 2009). Diversity on all levels of an organization is considered to be crucial as a fuel in the quest for novelty and creativity whereas homogenous agents will, on the other hand, cause prediction and stability.

The literature of Complexity Theory suggests that *relationships* are the key determiner of "everything", something which, from a leadership perspective, necessitates emotional intelligence and relationship orientation.

Trend 7: Emotional intelligence and relationship-orientation are essential aspects of leadership

A strong majority of the responses believe that emotional intelligence is far more important than technical intelligence (factor 16). 85.2% of the responses support the statement that having insight and an understanding of the people one leads and cooperates with is *the most important feature* of military leadership (question 31, factor 16), while on the other hand

[21] Please see chapter 3 on discussion of resilience in complex systems.

merely 24.6% support a perception that having insight and understanding of the technical system one operates (e.g. a weapon's system, a platoon) is *the most important* feature of military leadership (question 45, factor 16).

The belief that emotional intelligence is an essential aspect of leadership is further substantiated by the Officers' belief (63.9%) that the most important thing in order to achieve success as a leader in an organization is to be relationship-oriented (question 14, factor 14).

Literature

At the heart of any complex organization is the intricate and dynamic relationship between the interacting individuals (Osborn & Hunt, 2007: 330). In order to facilitate human interacting and bottom-up processes it is crucial for any leader to focus on micro-level interaction, something which speaks for the importance of leaders' ability to facilitate emotional awareness and empathic capacity (Karp and Helgø, 2007: 35). From this it follows that emotional intelligence and an *"an increased capacity to think, feel, reflect and imagine"* (Stacey, 2005: 11), is far more important than technical intelligence which emphasizes rational reasoning (Tobin, 2005: 67; Martin, 2007: 7; Wheatley, 146, 148-149, 154; Darwin, 2001, 482).

A number of trends supporting a Complexity Approach have been presented so far in this part of the chapter. Due to strongly contradicting results there are, however, questions and factors that have yet to be presented. The next section will present some additional findings.

6.4.3 Additional findings

A Complexity Approach to leadership normally postulates an indirect approach to leadership, while a traditional approach often suggests a direct approach. When confronted with two contradicting statements, one supporting an indirect approach and the other a direct approach, a vast majority (86.9% on question 39 & 93.4% on question 53, factor 24) agree with both, thus revealing a highly contradictory reply.

The same trend is evident, though to a lesser degree, when confronted with their attitudes towards holism (factor 7). On the one hand a majority of the Officers (52.5%) support a reductionist approach where the whole is best understood and analyzed through the sum of its parts (question 7), while on the other hand 55.7% state that the whole is greater than the sum of its parts (question 22).

The trends and results that have been presented so far have included all demographic variables from the survey. The next section will present some results comparing relevant demographic data.

6.5 Demographic Variables

The survey made use of a number of democratic variables in order to make it possible to identify trends across variables such as educational level, age, gender and military background.

The use of the majority of these demographic variables as a basis for comparison is not viable due to their uneven distribution. The distribution of participants on the different branches of Army, Navy and Air Force, is however relevant and will be subject for further investigation.

The next section will compare the results between the branches of Army, Navy and Air Force highlighting possible dissimilarities in their pattern of responses.

6.5.1 Comparison of Results between Army, Navy and Air Force

As figure 22 illustrates the main trend that can be highlighted is that there is remarkable homogenous results between the branches of Army, Navy and Air Force.

The graph is developed capturing the added percentage of each branches' responses of *strongly agree* and *agree* on each question using descriptive statistics calculated in SPSS. For instance, on question 1 4.2% of the Army Officers *strongly agree* and 58.3% *agree* something when added give a total percentage of 62.5%. The calculation is then repeated for the Navy and the Air Force and captured in the graph for the purpose of comparison.

While on the one hand this dissertation states that the results reveal a remarkable homogenous trend between the branches, there are trend lines in the graph that disclose some dissimilarities. More interestingly however is that taking into consideration the level of "uncertain" responses on the questions where the branches might seem to differ, very few counter trends can be identified. Put differently, despite illustrating a relatively different percentage on some questions the divergence between the branches are in most cases caused by "uncertain" responses and not by disagreement.

Taking this fact into consideration we are left with two questions revealing particular points of distinction.

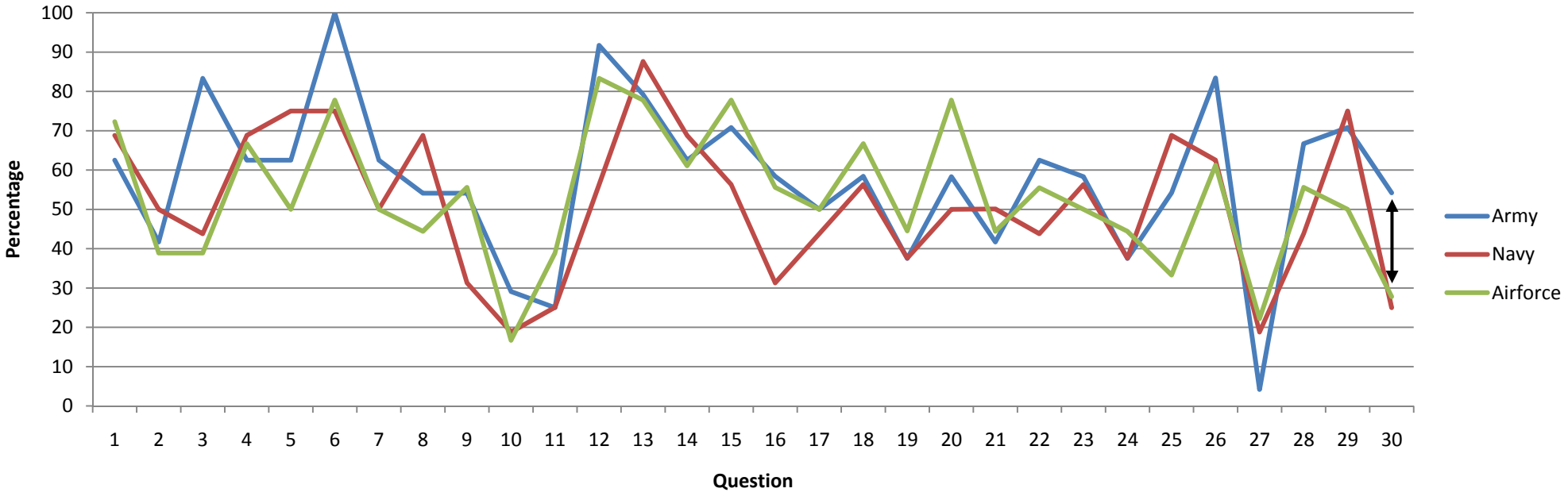
The first concerns whether or not the Officers usually make spontaneous decisions based on intuition (question 30, factor 15). A statement in which a majority of the Army Officers agree with (54.2%), but a relative majority of Navy- and Air Force Officers disagree with (43.8% and 44.5%).

The same trend is evident on question 42 where nearly half of the Army Officers (45.9%) believe that a leadership style described by the metaphors of gardener, steward, servant, missionary, facilitator and convener is a good way of describing their leadership style, while 50.0% of Navy Officers and 61.1% of Air Force Officers on the other hand disagree with this view.

Despite the differences on these two isolated questions it may be argued with certainty that the results between the branches of Army, Navy and Air Force are highly homogenous, a fact which might be valuable in expanding this dissertation.

The part of this chapter which presents and discusses the results from the survey conducted at the Joint Staff College will now be approximated with a short discussion of the gaps and anomalies which have been revealed through the course of this analysis.

Figure 22 - Comparison between Army, Navy and Air Force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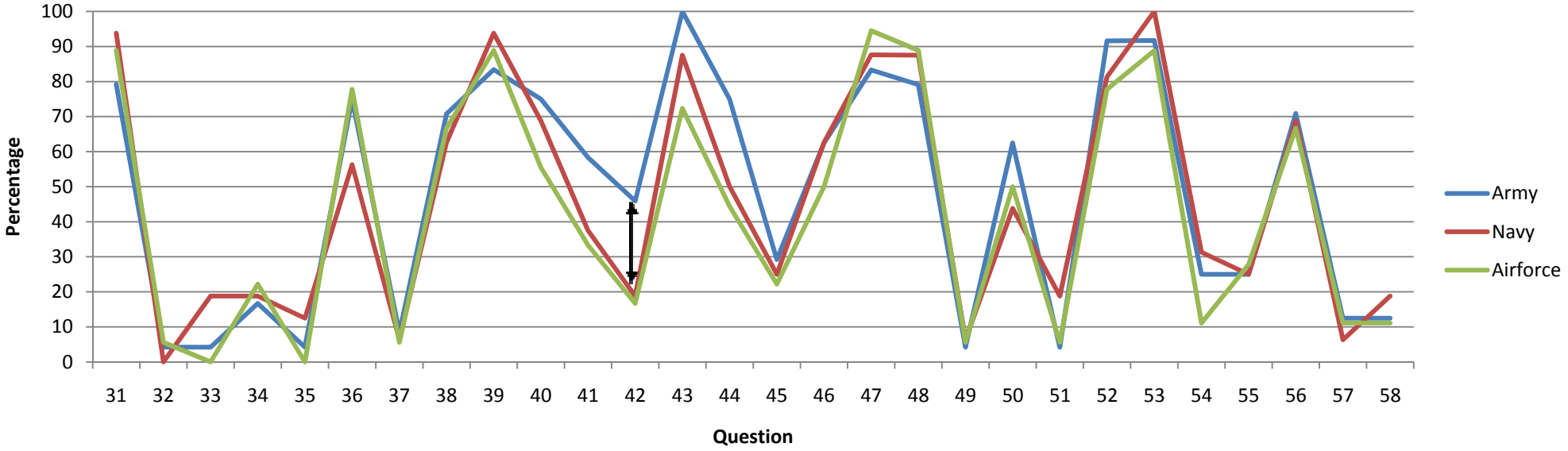
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6.6 Gaps and Anomalies

Because human behaviour can be characterized as complex and full of paradoxes and contradictions, it may be argued or inferred that the responses on a number of questions and factors in this survey are also contradictory.

The questionnaire was developed around factors which had two questions each where one represented a Newtonian perception and the other a Complexity Approach on that specific topic which the factor represented. Due to relatively different features between a Newtonian and Complexity Approach the questions were often formulated as contradictory statements allowing the participants to take a stand using a five point Likert scale.

Despite integrating these design techniques the results reflect a number of contradictions. For instance, 63.9% believe that the *most important thing* in order to achieve success as a leader in my organization is to be relationship-oriented (question 14, factor 14), whereas 65.6% simultaneously state that the *most important thing* in order to achieve success as a leader in my organization is to be task-oriented (question 29, factor 14). Another example is linked to the issue of indirect or direct approach to leadership whereas 86.9% support a direct approach (question 39, factor 24), while at the same time 93.4% substantiate an indirect approach (question 53, factor 24).

This dissertation does not find that these contradictions are detrimental to the value of the responses, but instead highly valuable as a verification and confirmation that human behaviour cannot be fully captured within artificial boundaries of theories and concepts. It would be most surprising, and for the Norwegian Armed Forces' sake frightening, if the responses exclusively followed an either main stream Complexity or Newtonian Approach. Another aspect relating to the case of contradictory replies is that both statements linked to a factor may be thought to be of equal importance or perceived to be of complimentary values to each other.

As the results and trends from the survey conducted at the Joint Staff College have now been identified and discussed it may be of some interest to compare the findings with a similar survey conducted at the Norwegian Military Academy.

6.7 Comparison between Surveys Conducted at Joint Staff College (JSC) and Military Academy (MA)

The purpose of this part of the chapter is to compare the surveys conducted as the Joint Staff College and Military Academy respectively with the view to of revealing possible similar trends in the different samples.

The survey developed by Rønn (2009) was conducted on 117 participants at the Norwegian Military Academy, Branch of Army, line of Operational Studies, in May 2009.

The sample was primarily male (95.7%) with the rank of Second Lieutenant – First Lieutenant with a majority of the respondents aged between 24 and 27 years where almost all the respondents had previously served in Army Units.

Using the measuring instrument developed by Rønn (2009) and descriptive statistics in Statistical Packages for Social Sciences (SPSS) results were calculated offering a basis for the identification of certain Newtonian and Complexity trends which were articulated as follows.

- Trend 1: Conflict, chaos and change is perceived as something negative
- Trend 2: Forecasting, long term planning and goal-orientation is the key to success
- Trend 3: The Cadets foster direct leadership based on a “hard” leadership-style and do not believe in self-organization.
- Trend 4: The Cadets embrace rational thinking
  Trend 5: The Army is an open system characterized by unpredictability and uncertainty
- Trend 6: The Cadets perceive themselves as informal leaders that encourage novelty
- Trend 7: Emotional intelligence and relationship-orientation are essential aspects of leadership

The overall results reveal that the participants from the Military Academy had a relatively balanced worldview between Newtonian and Complexity Principles.

With this information at hand, let us continue by describing and discussing the methodology of comparison.

6.7.1 Methodology

The comparison between the surveys is based on the results using the measuring instrument developed by Rønn (2009).

As described in chapter 2, Research Design and Methodology, some changes were made to the questionnaire when used at the Joint Staff College with the view to increasing the quality of the survey.

In figure 23 and 24, the aforementioned changes have been highlighted with either the symbol of a square (■) or triangle (▲. The square indicates that the question has been extensively modified since the survey conducted at the Military Academy which is anticipated to have a major potential impact on the results on that specific question (for the purpose of comparison). For instance, question 25 was changed from the original "A decision or action made by a sergeant on team level can create big effects at the strategic level" to "Great effort *usually* creates great effects".

The triangle on the other hand represents questions with relatively modest changes which are expected to have little impact on the results on that specific question. For instance, questions 48 was changed from "As a military leader I get my power as a result of being recognized as a leader by the other group members through the everyday interaction" to "Military leaders get their power as a result of being recognised as a leader by the organization's members through the everyday interaction".

The gap between responses at the Joint Staff College and Military Academy in terms of different attitudes towards Complexity and Newtonian Principles may therefore (or may not) be due to changes made in the formulation of the question and not necessary reflect a difference in opinion between the samples.

When comparing one must also take into consideration that the changes made to the questions (as described in chapter 2) may have increased the quality of the question which in turn has lowered the uncertainty response. From this it follows that it may substantially impact on the results in terms of comparison which most likely is the case with question 21 and 36. As illustrated in figure 23 and 24 there is a considerable gap between JSC responses and MA responses on these specific questions. It is reasonable to assume that this gap can be explained by the fact that the uncertainty percentage was very high on the survey conducted at the MA, but considerably lower at the JSC.

In order for this dissertation to present valid trends when comparing the two surveys the questions that have been either significantly changed or where the uncertainty percentage differs considerably the questions mentioned will be used with caution.

The next section will now continue by comparing the demographic data from the two surveys.

6.7.2 Comparison of Demographic Data

In terms of similarities the samples are gathered from the same organization, the Norwegian Armed Forces and within the same environment, educational institutions. The distribution as regards gender is relatively even, something which also represents the *de facto* distribution in the whole organization.

Label	Joint Staff College	Military Academy
Participants	61	117
Rank	Captain – Major – Lieutenant Colonel	Second Lieutenant - Lieutenant
Male participants in percentage	92.0%	95.7%
Female participants in percentage	8.0%	4.3%
Minimum, maximum and average age	31/48/40	20/31/25
Distribution on branch (Army, Navy, Air Force) in percentage	39.3%/ 26.2% /29.5%	100.0% / 0.0% / 0.0%

Table 10- Comparison of demographic data

The participants from the Military Academy can be considered to be lower level Officers while the respondents from the Joint Staff College can be regarded as medium level Officers. All Norwegian Military Officers attending the Joint Staff College have previously attended the Military Academy.

The Joint Staff College is the highest educational institution within the Norwegian Armed Forces and Officers from all branches (Army, Navy, Air Force etc.) attended the courses. The participants from the Military Academy, however, are strictly Army Officers (table 10).

In light of the methodology and the demographic data it is now left to us to explore the results.

6.7.3 Comparison of Results

The main pattern one can identify when evaluating the trend lines in figure 23 and 24 is that the responses from the Joint Staff College and the Military Academy are similar to a large extent. In other words, the trend of homogenous thinking identified in the comparison between the different branches at the survey conducted at the Joint Staff College is further substantiated.

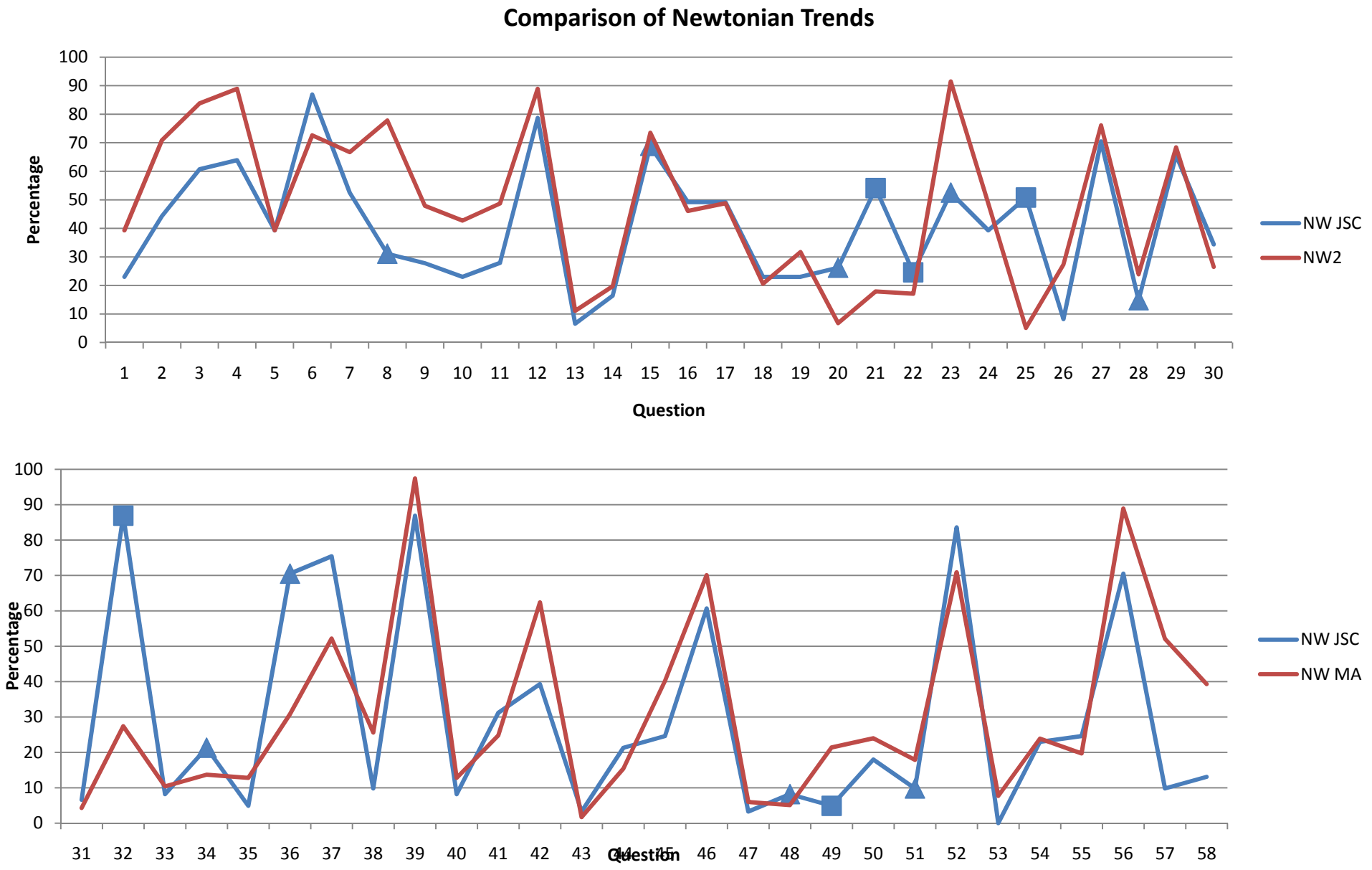

Figure 23 - Comparison of Newtonian Trends

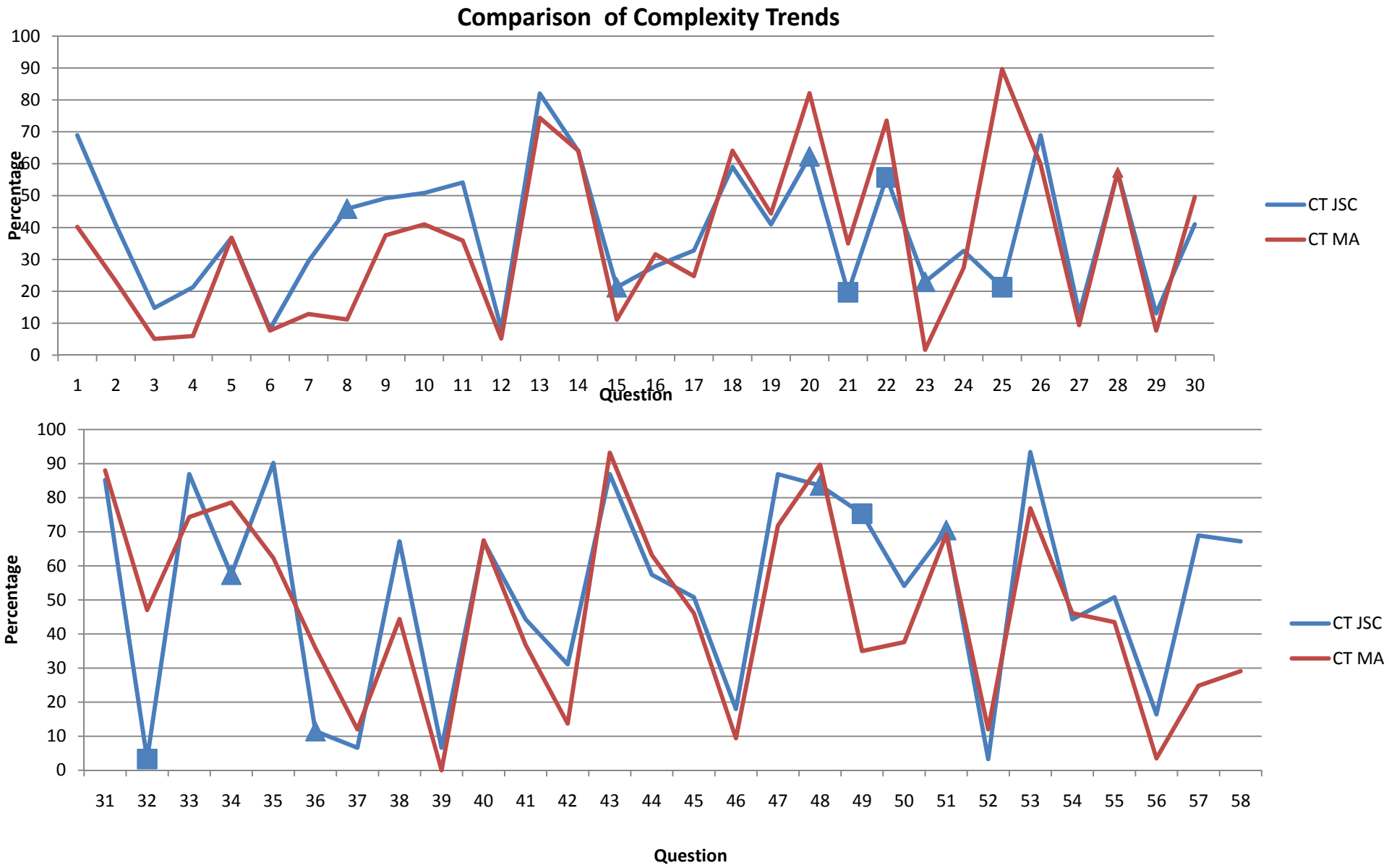

Figure 24 - Comparison of Complexity Trends

There is however divergence on some questions that needs to be highlighted.

First and foremost, the participants from the Joint Staff College have a more positive relationship to *chaos* (factor 8). Compared to the results from the Military Academy, where as much as 84.65% of the responses support a Newtonian perception of chaos, 41.8% of the responses at the Joint Staff College share that point of view.

Secondly, a majority of the responses (52.1%) at the Military Academy support the statement that in order to manage uncertainty and unpredictable situations military leaders should focus on detailed planning and automatic responses (question 57, factor 28), while only 9.8% of the responses at the Joint Staff College substantiate that perception.

Thirdly, 67.2% of the responses at the Joint Staff College disagree that the *most important* leadership trait is the ability to follow procedures to solve a mission within the given resource framework (question 58, factor 29), whereas 29.1% of the responses at the Military Academy confirm a similar attitude.

Fourth, finally and perhaps the weakest trend which is worthwhile mentioning in this comparison, is the notion of creating or maintaining control (question 11 – factor 11), which seems to be of less importance for the Officers at the Joint Staff College than the Officers at the Military Academy. 48.7% of the responses at the Military Academy support a Newtonian Approach to control compared to 27.9% of the responses at the Joint Staff College.

The pattern that can be identified one these specific questions and factors is that the Officers at the Joint Staff College identify slightly more convincingly with Complexity Principles than the Officers at the Military Academy.

The trend on these specific questions might also have some relevance taking the whole survey into consideration as the average values on adherence towards general Complexity and Newtonian Principles (figure 25) and a Complexity and Newtonian Approach to leadership (figure 26) indicate that the participants at the Joint Staff College have a somewhat more pronounced tendency towards Complexity Principles than their younger colleagues at the Military Academy.

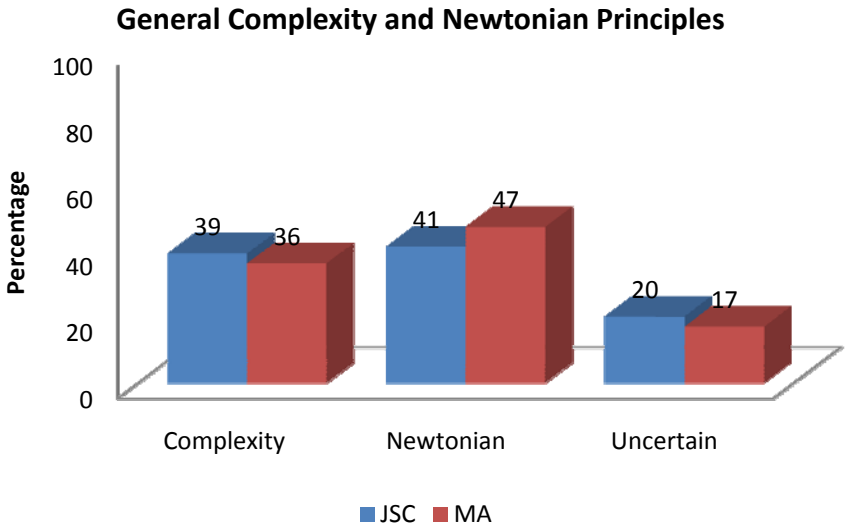

Figure 25 - Comparison general Complexity and Newtonian Principles

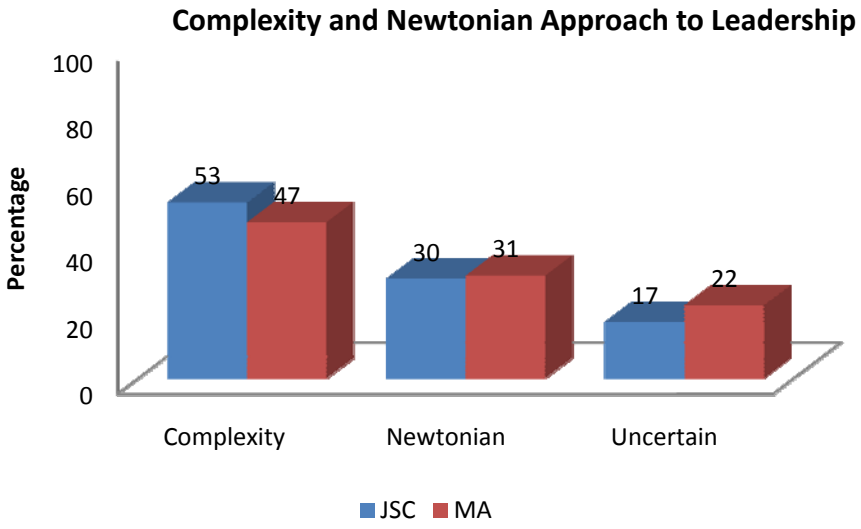

Figure 26 - Comparison Complexity and Newtonian Approach to Leadership

This dissertation can, however, with certainty conclude that there is minor differences in the responses between the surveys conducted at the Joint Staff College and the Military Academy, and that the main pattern is homogenous thinking.

The results from this chapter will be further discussed in the next chapter.

A summary of the most important findings of this chapter will now be presented.

6.8 Summary

The purpose of this chapter was to clarify the Norwegian Military Officers' relationship to Complexity and Newtonian Principles. The following research objective was articulated:

Research objective 4: Based on an empirical survey, describe and analyze Norwegian Officers' worldview against the principles of a Complexity Approach and leadership in complex systems.

Research objective 5.1: To present the main trend from the survey and describe the organization of the presentation.

The results from the survey reveal a relatively balanced adherence towards Complexity and Newtonian Principles, where the first part investigates general Complexity and Newtonian Principles disclose a slight Newtonian majority while the latter part investigates a Complexity and Newtonian Approach to leadership and unveils a relatively stronger Complexity trend.

Research objective 5.2: To present the method of calculation

This dissertation uses SPSS (Statistical Package for the Social Sciences) and descriptive statistics reporting frequencies for all respondents and across demographic groups.

Research objective 5.3: To present the sample description

The survey had a total of 61 participants from the Joint Staff College distributed on two educational levels, the Staff Officer Course and Masters Degree Study with 77% and 23% of the respondents respectively.

The participants were mostly males (92.0%) in the rank range of Captain, Major and Lieutenant Colonel with an average age of 40 years.

39.3% of the participants had Army background, 26.2% Navy, 29.5% Air Force and 4.9% were Civilian.

Research objective 5.4: To present and discuss data and trends supporting a Newtonian Approach.

The following Newtonian trends where identified:

- Trend 1: A Complexity perception of conflict, chaos and disruption are perceived to be dysfunctional
- Trend 2: The Officers are highly goal-oriented
- Trend 3: The Officers believe that rational mechanisms such as long term planning and prediction are crucial to achieve success
- Trend 4: The Officers believe in leadership dependence, a person-oriented leadership and (a traditional) "hard" leadership style

Research objective 5.5: To present and discuss data and trends supporting a Complexity Approach.

The following Complexity trends were identified:

- Trend 5: The unpredictability and uncertainty of the Armed Force's milieu necessitates adaptation
- Trend 6: Decentralization and change is perceived to be something positive
- Trend 6: The Officers perceive themselves to be informal leaders that encourage novelty
- Trend 7: Emotional intelligence and relationship-orientation are essential aspects of leadership

Research objective 5.6: To present and discuss data and trends across demographic variables.

A comparison between the responses of Army, Navy and Air Force were conducted revealing a highly homogenous pattern.

Research objective 5.7: To discuss gaps and anomalies

Contradicting replies do occur in the participants' replies, although it is of no major concern for the validation of the results.

More importantly is to highlight that the absence of contradictory replies would have been highly surprising and unexpected.

Research objective 5.8: To compare the surveys conducted at the Joint Staff College and Norwegian Military Academy.

A survey was conducted at the Norwegian Military Academy by Rønn (2009) investigating the Cadets' relationship to Complexity and Newtonian Principles.

Using the same measuring instrument at the survey conducted at Joint Staff College, this dissertation compared the results from the two surveys with the view to identifying any similar or dissimilar patterns in the two samples' responses.

The main trend in the comparison between these two is the notion of homogenous thinking, whereas the responses in the two surveys are highly similar.

The next chapter will interpret the findings of chapter 6 with other empirical research and discuss the framework of a meta-competency model for leadership in complex military systems.

Chapter 7 – Complexity and Competencies - The Framework of a Meta-Competency Model for Leadership in Complex Military Systems

The purpose of this chapter is to present and discuss the framework for a meta-competency model for leadership in complex military systems.

The previous chapters have been based on non-empirical literature reviews and an empirical survey which has served to highlight a number of aspects related to complexity. The next step for this dissertation is to integrate a discussion of competency-literature into a description of the general framework of the meta-competency model. This chapter is essential in obtaining research objective 5 which is as follows:

Research objective 5: To develop a meta-competency model for leadership in complex military systems.

In order to achieve research objective 5 this chapter is divided into multiple sub-objectives:

Research objective 6.1: To describe and discuss competencies.

Research objective 6.1.1: To define competencies.

Research objective 6.1.2: To describe and discuss contemporary use of competencies

Research objective 6.1.3: To describe and discuss competencies for public management/leadership

Research objective 6.2: To describe and discuss the development of a meta-competency model for leadership in complex military systems

Research objective 6.2.1: To describe and discuss the background for the development of the model

Research objective 6.2.2: To describe and discuss the framework of a meta-competency model for leadership in complex military systems.

Research objective 6.2.3: To describe and discuss the use of meta-competencies as guiding mechanism in a complex environment.

Research objective 6.3: To summarize the most important features of this chapter.

This chapter will have two main components, the first is about general competency literature and second, about the development of the meta-competency model for leadership in complex military systems.

The first discussion comprises a presentation and debate about definitions of competencies and how competencies are used in organizations. In this dissertation I will argue that the presented definition of competencies is not an adequate definition in a complexity setting. Thereafter, competencies for public management/leadership will be discussed with the intent of identifying certain characteristics of the public sector context and public sector management which may impact the development of the meta-competency model.

The second part of this chapter will initially repeat some of the rationale behind the development of a meta-competency model for leadership in complex military systems and further investigate the competencies of Norwegian Military Officers by analyzing the empirical findings in chapter 6 in a wider research perspective. After concluding that a need exists among the Norwegian Military Officers to further develop competencies for a complex environment, the discussion will continue by proposing a new definition of competencies adjusted to a complexity understanding of the world. This will be followed by criticism of contemporary use of competencies and presentation of meta-competencies as a useful guiding mechanism in a complexity setting. The second part of this chapter ends with a short overview of those competencies identified in the literature that feature as relevant in a complexity setting.

Thereafter, this chapter provides a summary of the most important findings.

7.1 Competencies

An overview of competency literature reveals that defining “competencies” or related terms such as “competence” is a challenging task for the researcher. The challenge is found not in the actual definition itself, but in that the concept of competencies is such a versatile, multi-disciplinary and qualitative field of research that one can choose to define competencies according to what one finds appropriate. This leaves the researcher with a rather broad scope for defining the concept ‘competency.’

In order to navigate the labyrinth of competency literature, this part of the chapter begins with a description of what can be considered to be contemporary competency literature, with a particular emphasis on a discussion around the definition of the term and the use of

competencies as a means of obtaining organizational objectives. Thereafter, the debate around competencies will be attributed to the context of the public sector where competencies normally associated with public managers are highlighted.

7.1.1 Defining Competency

The first step in identifying what competency is, or put more precisely, what it can be perceived to be, is to present some thoughts around what *constitutes* a competency.

First, and most importantly, competency is an expression related to something *organic*, whether it is an expression for something individual or systemic. Secondly, and depending on the angle of the discussion, it is *qua concept* something *qualitative*, but as parts of this section will illustrate, many approaches to competencies emphasize a quantitative approximation. Thirdly, competencies are inherently abstract (characteristics) but may be transferred to concrete actions (behaviour).

A widely used definition of competency is the one of *"an underlying characteristic of an individual that is causally related to effective and/or superior performance in a job or situation"* (Thach & Thompson, 2007: 357; Briscoe & Hall, 1999: 37).

The term 'characteristic' may be interpreted as a *defining feature*, *"a feature or quality that makes somebody or something recognizable"* (Microsoft Encarta, 2008 (20)). This characteristic may be linked to something intrinsic, for instance personal characteristics or preferences, or something external, for instance a specific behaviour or action (Bhatta, 2001: 195). The defining features will or may, according to the definition, then be linked to a certain outcome through a causal interaction process between characteristics, behaviour and desirable performance. An important assumption, then, is that certain attributes of *somebody* or *something* can be identified and reproduced through training and education, which consequently results in effective performance (Reed et al, 2004: 50).

Draginidis and Mentzas (2006) supply a number of other definitions for what may be understood by 'competencies'. These may help to broaden our perspective of what competencies are perceived to be among the scientific society (table 11).

Definitions	
Marrelli (1998)	Competencies are measurable human capabilities that are required for effective work performance demands
Dubiois (1998)	Competencies are those characteristics – knowledge, skills, mindsets, thought patterns, and the like – that, when used either singularly or in various combinations, result in successful performance
LeBoterf (1998)	Competencies are not themselves resources in the sense of knowing how to act, knowing how to do, or attitudes, but they mobilize, integrate and orchestrate such resources. This mobilization is only pertinent in one situation, and each situation is unique, although it as an analogy to other situations that are already known
Selby et al (2000)	Ability expressed in terms of behaviour

Table 11 - Definitions of the competency concept (adapted from Draginidis and Mentzas, 2006: 52)

Marelli (1998) supports a quantitative approximation by defining competencies as *measurable* human capabilities. According to Zook (2006: 3) this approximation is a relatively normal approach in contemporary definitions of competencies. Dubiois (1998) points to the fact that competencies, or the effect of competencies, can not necessarily be interpreted in isolation, because in doing so one questions the causality between specific competencies and specific performance. LeBoterf (1998) integrates the notion of relativism in the competency debate by calling attention to the uniqueness of each situation, while Selby et al (2000) emphasizes the behavioural aspect of competencies.

Another aspect of competencies is presented by Terry (1996) who links competencies to a systemic level and as the desirable output of a process (table 12). In this context then, it may be argued that the actual performance of the system can be considered as a competency, while in the latter discussion the input (underlying characteristics) and the action taken (behaviour) have been central.

	FEEDBACK		
	INPUTS	**PROCESSES**	**OUTPUTS**
National level	National budgets and resources	National institutions, policies and systems	National competencies
Organizational level	Organizational training centers and budgets	All learning systems	Organizational strategic competencies
Individual level	Time and expenses	Learning methods	Individual competencies

Table 12- A Systems Approach to Competencies (Terry, 1996: 41)

As mentioned at the start of this section the terms “competencies” and “competence” are closely related and often, and perhaps correctly, used arbitrarily (Nieuwenhuyzen, 2009: 19). While competencies on the one hand may be defined as an expression of the underlying characteristic or the behaviour of an individual (or system), competence on the other hand reflects a contextual evaluation of the competencies. For instance, if one characterizes a person as *competent* one would indicate that according to a defined set of standards that person is doing a good job.

The discussion in this section has been represented by labels such as competency, competence and performance. Nieuwenhuyzen (2009) presents a causal flow model of these labels where an agent’s personal characteristics forms the foundation for specific behaviour (competency), which in turn leads to job performance measured against a set of standards (competence) (figure 27).

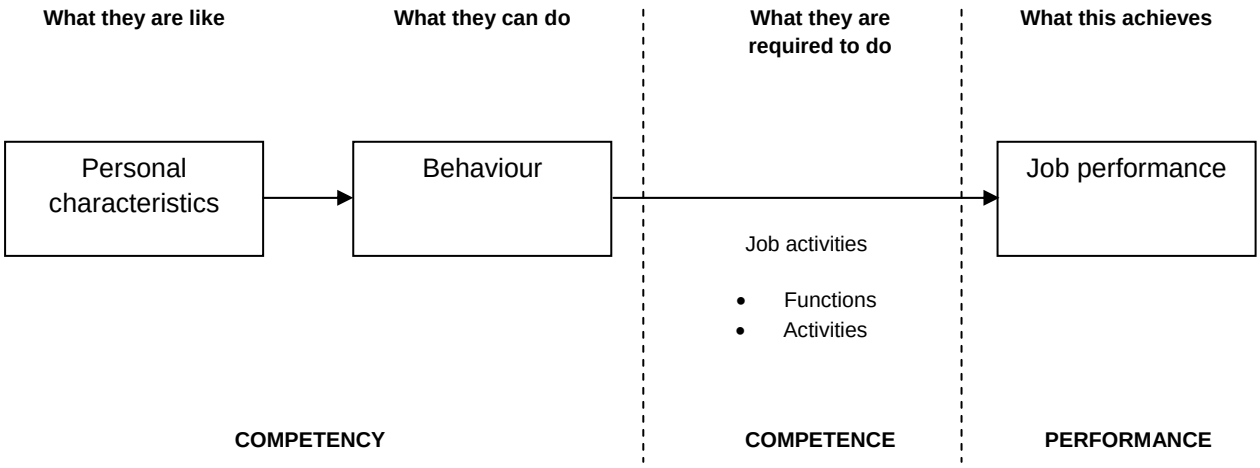

Figure 27 - Adjusted competency causal flow model (adapted from Nieuwenhuyzen, 2009: 19)

For the purpose of this dissertation, and particularly in the context of a Complexity Approach, one can ask critical questions concerning the relevance of the definitions presented in this section. Consequently, no single definition will be settled on as the basis for the development of the meta-competency model for leadership in complex military systems. Instead, this question with be revisited in a later section of this dissertation.

However, this point of view does not mean that we do not have sufficient background to continue the debate about competencies in a contemporary setting. The next section discusses the empirical use of competencies and what benefits it may have.

7.1.2 Contemporary Use of Competencies

Firstly, the use of competencies in organizations is a flexible approximation. Like many other qualitative phenomena such as values, the use of competencies is, *qua concept,* portable across artificial boundaries such as time, level of authority, level of responsibility and unforeseen situations (Horey et al, 2004: 2), although it is not unusual (and sometimes legitimate) to create limitations of its use or in the manner it is used.

The use of competencies may be manifested in approaches like competency frameworks, competency lists, competency modelling, competency mapping, and core-competencies. According to Järvalt and Veisson (2005:2) and Walker (2006: 51) competency frameworks or equivalent approaches have been embraced by a large number of developed countries, in both the private as well as the public sector. Fallesen et al (2005: 1) argue that some studies report that up to 80% of businesses use competency modelling.

A study by Briscoe and Hall (1999: 37-39) of 31 leading North American organizations indicates that the most significant benefit of competency methods is that they provide organizations with a "common language" that can help the organization discuss *"executive performance, selection, development and advancement"*. Interpreted more widely, one can argue that competency approaches help align the organization to a central purpose (Fallesen et al, 2005: 1). Using yet another metaphor, one could say that competency methods may function as the "glue" holding the many elements of the organization together and consequently promotes a unified and synchronized approach (Järvalt & Veisson, 2005: 3).

Competency approaches do not focus on the technical requirements of a particular job (Horey et al, 2004: 2), but rather state desired qualifications in terms of individual characteristics or behaviour (Fallesen et al, 2005: 1). From this it follows that competencies may be a guiding tool for individual self-development, visualizing and communicating what is considered to be useful behaviour in that given organization and outlining frameworks that may provide insight in order to select, develop, and understand leadership effectiveness (Hollenbeck et al, 2006: 402-403).

Reed et al (2004: 48-49) argue that competency approaches can generally be characterized as formal and top-down process. The methodology is governed by attempts to identify, number and list competency descriptors, for instance skills, attributes and traits, which again can be broken down into sub-components to create comprehensive models of clusters of competencies for instance.

The purpose of this dissertation is to develop a meta-competency model for leadership in complex military systems. It is therefore natural and necessary to discuss competencies in a public sector context. This forms the discussion component of the next section

7.1.3 Competencies for Public Management/Leadership

It might be worthwhile initiating this section with a reminder that this dissertation does not differentiate between leadership and management. With reference to the discussion in chapter 4, Complexity and Leadership, it is argued that leadership and management are highly interconnected and support the same basic and emergent process of local interaction (Boal & Schultz, 2007: 412). Treating them as two separate concepts will, at least from a complexity perspective, be highly artificial and misleading (Taylor, 2005: 140).

In a public management setting competencies should in essence be used to describe what managers or leaders do to support individual and organizational success (Horey et al, 2004: 2). A competency approach is often an expression of what has historically led to success and what the organization expects will be important future accomplishments to achieve (Järvalt & Veisson, 2005: 3).

Kroon (1995: 17) has identified three types of skills that managers in general should possess, functional-, people- and conceptual skills. Functional skills are best understood as the skills needed in order to understand and execute procedures, processes and methods. People skills refer to an individual's interpersonal abilities which are central in team processes and in the intersection between management and work teams, while conceptual skills are classified as the ability to observe an organization in its totality (Ketel, 2005: 48). Kroon (1995: 17) further discusses the relative importance of each category of skills across different management levels, namely top-, middle- and lower management, arguing that each level requires different emphasis (table 13).

Management level	**Percentage of skills**		
	Technical (functional skills)	People skills	Conceptual skills
Top Management	8%	42%	50%
Middle Management	22%	50%	28%
Lower Management	42%	50%	8%

Table 13- Effective Management Skills (Kroon, 1995: 17)

Cronje et al (2001:108) illustrate how managers play various roles in an organization by differentiating between an interpersonal role, a decision making role and an information role (figure 28). The different roles require the managers to play out certain functions, for instance

the interpersonal role requires the manager to be a representative figure, leader and liaison, while the decision making role call for other functions.

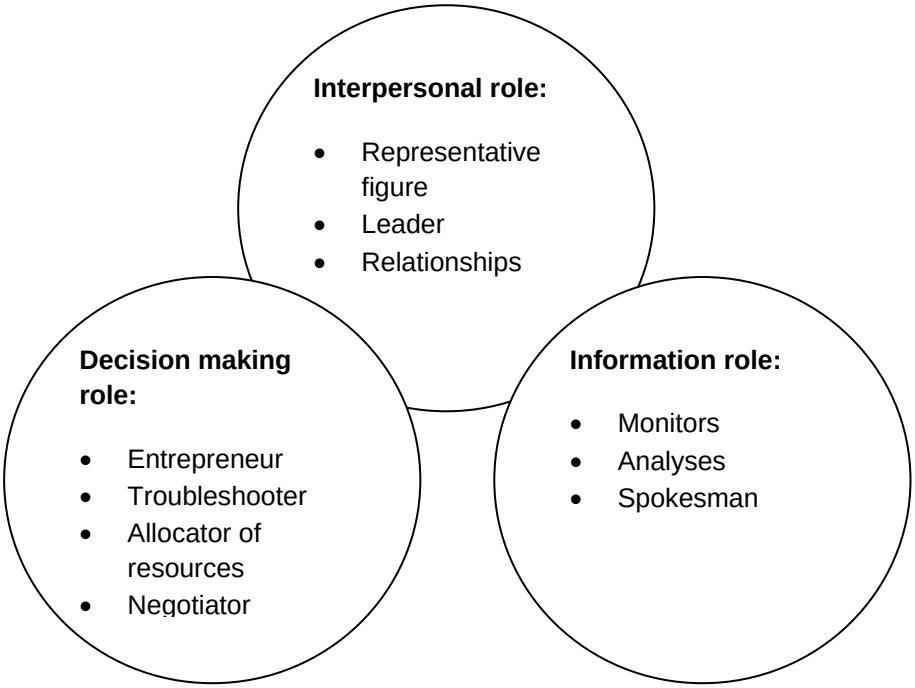

Figure 28 - The overlapping roles of managers (Cronje et al, 2001: 108)

The skills, roles and functions illustrated in this section so far are something one can argue is relevant to all managers, irrespective of sector. It may, however, be fruitful to examine some of the differences between public and private sector as the context of these different sectors may affect what competencies are considered to be relevant.

7.1.3.1 A Comparison of Public and Private Sector

The first characteristics this dissertation aims to highlight is the fact that the public sector is operating in a milieu of stronger political and judicial constraints than the private sector with a number of implications for the degree of complexity and flexibility (Schwella, 2001: 14). One can argue that more technical constraints (for instance rules) create more boundaries which in turn increase the complexity *within* the organization, something which makes the organization less capable of reacting adequately to fluctuations in the environment.

Secondly, the public sector is formally and informally exposed to strong demand for accountability and transparency (at least from a normative point of view), while such an

approach in the private sector may be defined as a competitive strategy, not necessarily an obligation.

Thirdly, it may be argued that the value system of public servants, loosely termed the public "ethos", does, distinguishes itself from the private sector "ethos" by being more socially oriented, less occupied by materialistic things and its own carrier (Knudsen, 2008; Sørensen, 2007; Schwella, 2001: 14).

Fourthly, the purpose of the two sectors is fundamentally different. The existential foundation for the public sector is aimed at securing welfare while the private sector aims to create profit (nevertheless one must acknowledge the symbiotic relationship between these two sectors).

Fifth and finally, a large part of the public sector is qualitatively oriented not necessarily on quality in itself but on something which is hard to quantify, for instance health care. Thach and Thompson (2007: 357) argue that profit oriented organizations measure the success of their strategies in financial terms, whereas public sector organizations and non-governmental organizations (NGO) produce value that lies in the achievement of social purposes. Ketel (2005: 56) points to the fact that qualitative orientation and the very complex nature of the public sector environment makes it hard to objectively observe and evaluate performance in terms that many private sector companies do it.

Having illustrated some differences between the public and private sectors the next step is to discuss some possible clusters of competencies often related to the different sectors.

7.1.3.2 Clusters of Competencies Related to the Public and the Private Sector

A study by Thach and Thompson (2007) of profit/non-profit organizations reports that there are some, although not large, differences in the profit/non-profit sector's perception of what constitute critical leadership competencies (figure 29). The biggest difference between the sectors is, perhaps as expected, on the skills associated with business and profit motive. The differences in "time management" *might* be due to differences in human resources systems (merit versus performance based) and a greater demand for accountability in the public sector (Thach & Thompson, 2007: 364).

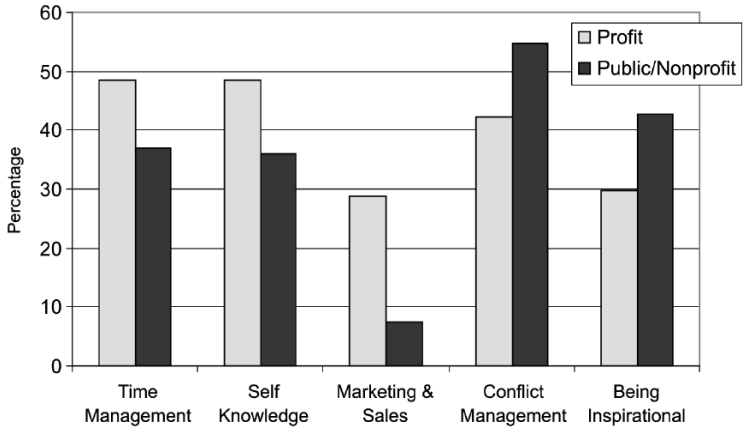

Figure 29 - Differences in competency/skills rankings (Thach& Thompson, 2007: 364)

The results from “conflict management” and “being inspirational” are according to the authors supportive of the literature.

Due to the focus on accomplishing social purposes generated by the demands and needs of numerous and complex constituencies, it is reasonable to assume that conflict management skills are more important among public sector leaders than private sector leaders. Being inspirational is perceived to be a highly relevant leadership competency for the public sector, something which may be due less to performance based incentives and generally lower wages than in the private sector (Thach & Thompson, 2007: 365).

Järvalt and Veisson (2005:3) claim that senior civil servants have, or should have, greater *political and ethical competences* than private sector managers, something one might find natural keeping in mind the fundamental differences between the sectors highlighted above. On the other hand one might argue that private sector leaders in the quest for profit are perhaps confronted with ethical dilemmas similar or greater than public managers, for instance questions concerning child labour or inadequate working conditions in low cost countries. However one must distinguish between ethical *competencies*, the ability to consider ethical questions, and ethical *competence*, the manner in which one behaves against a certain standard and that one can consider ethical or not. The first approximation does not necessarily lead to the latter.

It might also be interesting to investigate potential differences of what is perceived to be important competencies within the public sector. Bhatta (2001) presents a cross-jurisdictional comparison of competencies for senior managers in the public sector which is based on data from research conducted in the US, New Zealand, Australia, the Netherlands and the United Kingdom. Organized as clusters of competencies in figure 30, illustrate the differences

between the jurisdictions and the degree of prevalence against a competency benchmark survey conducted on 40 organizations (Bhatta, 2001: 202).

		Emphasis on Competency				
Competency[a]	*Degree of Prevalence (%)*[a]	*United States SES*	*New Zealand (Chief Executives)*	*Australia SES*	*Dutch SPS*	*United Kingdom SCS*
Team orientation (working in a team, team leadership, building and leading a team)	78	▲▲▲	—	—	—	—
Communication (communicating effectively; oral, written, and interpersonal communication)	65	▲▲▲	▲▲▲	▲▲▲	▲▲▲	—
Customer focus (customer service orientation; client focus)	65	▲▲▲	—	—	—	—
People management (managing and developing individuals; managing others)	58	▲	▲▲▲	▲▲	—	—
Results orientation (results focus; achieving results; goal orientation; drive for results)	58	▲▲▲	▲▲▲	▲▲▲	▲▲	▲▲▲
Problem solving (developing solutions; analytical thinking and judgment)	55	▲▲▲	—	▲▲	▲▲▲	—
Planning and organizing (operational planning; organization and work planning)	48	▲	—	▲▲	▲▲▲	—
Leadership (leading people)	43	▲▲	▲▲	▲▲	▲▲	▲▲▲
Business awareness (business and marketplace awareness; business orientation)	38	▲▲▲	▲▲	—	▲▲	—
Decision making (making sound decisions; decisiveness)	35	▲▲▲	▲	▲	—	—
Technical skills (job expertise and professional competence; professional ability; specialist skills and knowledge)	35	▲▲▲	▲▲	▲▲	—	—

Note. SES = Senior Executive Service; SPS = Senior Public Service; SCS = Senior Civil Service. See Tables 1 through 5 for further definition of competencies. — = no emphasis on; ▲ = scant emphasis on; ▲▲ = secondary (implied) emphasis on; ▲▲▲ = primary (specified) emphasis on.
a. Data taken from Benchmark Survey (Rankin, 2000/01).

Figure 30 - Comparison of competencies across jurisdictions (Bhatta, 2001: 203)

The first pattern that reveals itself from this presentation is that *one* uniform main trend across the jurisdictions does not exist. The emphasis on the cluster competencies of "communication", "results orientation" and "leadership" are the most prevailing cross jurisdictional trend, whereas the importance of the other cluster competencies are relatively scattered.

A second trend is a considerable difference between the cross jurisdictional comparison and the benchmark survey. "Team orientation", for instance, which was considered to be the most important cluster of competencies in the benchmark study, is only recognized by the

United States Senior Executive Service. Likewise, "result orientation" which is the primary emphasis of four out of five jurisdictions, has only 58 percentage prevalence in the benchmark study.

The public sector is a large and versatile domain with a number of different actors operating within a wide range of activities, where military organizations, for varying reasons, might be considered to be slightly different from other public organizations. A study by Aambakk on the differences between Norwegian military executives and Norwegian civilian executives (2007: 3), however, concludes that there are surprisingly *minor differences* what executives place emphasis on between military and civilian sector. A similar comparative study by Kjevik and Bjøseth (2008), where the scope of the research was conducted on a lower hierarchical level, reveals a similar pattern. Likewise, but from a leadership perspective, Pettersen (2007) concludes that there are small differences between Norwegian military officers and Norwegian civil society leaders when it comes to being "explicit", here defined as clarifying expectations, being present in the processes and providing adequate feedback (2007: 64-65).

This dissertation must emphasize that the differences that have been presented in this section are not an attempt to provide conclusive claims of what things are like in reality, but rather provide indications of how it *might* be. The comparison which has been presented indicates to the reader that the relevance of specific management competencies is very dependent on the context, whether the context is a country, sector or within an organization. As Pollit & Bouckaert (2003: 2) wisely say, "*we are constantly in danger of comparing apples and pears*".

An important macro-trend within the development of public sector thinking the last twenty years or so has been the reforms connected to New Public Management. This will be discussed in the next section.

7.1.3.3 New Public Management – New Demands on Public Managers

Despite the fundamental differences between the public and private sectors, perhaps the most significant trend in public reforms[22] during the last decades involves the integration of private sector mechanisms in the public domain, something which often is referred to as New Public Management (NPM).

[22]Primarily among members of the Organisation for Economic Co-operation and Development (OECD)

New Public Management is used as a collective term for modernization reforms in the public sector with the aim to incorporate neo-liberal principles (Christensen, 2003: 1). Some of the common denominators that can be identified across the reforms are:

- Productivity and efficiency are to be achieved through more focus on clearly defined goals and extended formalization of processes.
- Increased productivity and efficiency are to be obtained through the integration of various marked mechanisms which typically identifies the private sector.
- Customer satisfaction and communication with citizens are to be improved by a shift in focus from input to output.
- Decentralization of responsibility and greater freedom of action seeks to create less distance between user and policy maker resulting in increased capability of responding to public need and demand.
- The sum of the reforms is believed to increase accountability (Bale & Dale, 1998, 119; Fredrickson, 2003: 215; Manning, 2001: 298-299; Christensen, 2003: 3).

According to Virtanen (2000: 335) the doctrine of the NPM focuses on a strong frame of reference when defining what qualifications are expected of public managers. Due to the doctrine's fundamental focus on neo-liberal principles, the basic quest is for public managers to become more market minded and entrepreneurial (Ketel, 2005: 55). An extensive survey made by Ernst & Yong targeting public and private organizations in Norway and their relationship to Human Resources in times of crisis, reveals a support of some of the NPM principles, such as a desire to incorporate quantitative mechanisms for evaluation and more formalization through rules and regulations (Ernst & Young, 2009: 2, 18). Research by Christensen and Lægreid (2008: 12) based on an investigation of the relevance of NPM-reform elements among civil servants in Norwegian ministries does, however, conclude that the NPM-reform as a whole has had little impact on the civil servants.

The principles related to NPM are also subject to criticism. A significant drawback, some argue, is the long term negative socio-economical consequences such as increased social inequality due to the adoption of neo-liberal policies (Christensen, 2001: 4; Eilertsen & Bjerke, 2005). Some evaluation reports on NPM-reforms also strongly indicate that the size of bureaucracies increase (Christensen, 2001: 4), although the theoretical foundation is based on the opposite. Value- and qualitatively oriented organizations such as hospitals, educational systems or military forces is also reported to be marginalized as a budget-burden contributing to inefficiency (Christensen, 2001: 4), because their performance cannot be measured in quantitative terms.

Bearing in mind the specific characteristics of the public sector, potential cluster of competencies and common denominators in New Public Management reforms it is now left for us to discuss what competencies public managers need in a contemporary setting.

7.1.3.4 Contemporary Competencies for Public Managers

The discussion so far has indicated that "result orientation" and "leadership" (Bhatta, 2001), "ethical" and "political competence" (Järvalt & Veisson, 2005), and "conflict management" and "being inspirational" (Thach & Thompson, 2007) are important competencies in public management.

Virtanen (2000) provides a comprehensive list of 55 competencies for public managers which is based on an analysis of previous research done on competency lists of public managers (table 15), and which according to Ketel (2005: 61) "*challenge the traditional competencies of public managers".*

1. Conceptualisation	2. Interpersonal skills
3. Managing group process	4. Understand whole organization as a system
5. Concern with impact	6. Vision setter – basic purpose and direction
7. Diagnostic use of concepts	8. Communicate where organization will be in 20 years
9. Efficiency orientation	10. Create values and trust in order to achieve vision
11. Proactivity	12. Study emerging trends
13. Self-confidence	14. Transfer intellectual output to service
15. Perceptual objectivity	16. Motivator
17. Stamina and adaptability	18. Emphasize organization's values
19. Building and maintaining a power base	20. Create sense of excitement
21. Presenting ideas	22. Analyser- evaluate projects
23. Figurehead	24. Integrate conflicting perspectives
25. Leader – formal authority	26. Questions staff
27. Liaison with external and internal contacts	28. Task master – contribute knowledge
29. Monitor	30. Focus on results
31. Disseminator of information	32. Influence decisions at lower levels
33. Spokesperson externally	34. Make trade decisions and allocate resources
35. Entrepreneurial	36. Building contextual competencies
37. Disturbance handler	38. Leadership
39. Resource allocator	40. Human resource management
41. Negotiator	42. Promote creativity, learning and innovation
43. Use analytical techniques	44. Skills of remote management
45. Use of information technology as a transformative force	46. Management skills
47. Managing complexity	48. Technical background and experience
49. Communication	50. Credibility
51. Decision making	52. Autonomy
53. Financial Management	54. Openness/trust
55. Empathy and understanding	

Table 14 - Competencies for Public Sector Managers (adapted from Virtanen, 2000: 335)

With reference to the earlier discussion around the definition of competency and the contemporary use of competencies, the list presented by Virtanen (2000) serves as a comprehensive example. The content of the list illustrates that competencies may be used to describe *characteristics* (for instance entrepreneurial), *behaviour* (for instance presenting ideas) as well as *roles* (for instance negotiator).

The United States Army Research Institute for the Behavioural and Social Sciences presents eight leadership core competencies with 55 sub components for contemporary Army operations and is intended to serve as the central basis of leadership requirements for the U.S. Army (Horey et al, 2004; Fallesen et al, 2004) (figure 31).

Leading Other to Success: A leader motivates and influences others to take initiative, work toward a common purpose, accomplish tasks, and achieve organizational objectives.

Exemplifying Sound Values and Behaviors: Maintaining standards and providing examples of effective behaviors influences others to behave and perform similarly. All Army leaders should model Army values continuously. Modeling provides tangible evidence of desired behaviors and reinforces verbal guidance through demonstration of commitment and action.

Vitalizing a Positive Climate: A leader has a responsibility to establish and maintain positive expectations and attitudes which produce the setting for positive attitudes and effective work behaviors.

Ensuring Shared Understanding: By understanding the nature and power of communication and practicing effective communication techniques, one can better relate to others and translate goals into actions. Communication is essential to all other leadership competencies.

Reinforcing Growth in Others: Assisting others to grow as individuals and teams facilitates the achievement of organizational goals and is a primary function of leadership.

Arming Self to Lead: Only through being prepared for missions and other challenges, being aware of self and situations, and the practice of career long learning and development can one fulfill the responsibilities of leadership.

Guiding Successful Operations: Ultimately, a leader's purpose is to provide guidance and maintain control over the work environment in order to increase efficiency and effectiveness in one's own and subordinate's activities.

Extending Influence: Leaders need to influence beyond their direct lines of authority and beyond chains of command; this influence may extend to joint, interagency, inter-governmental, multinational, and other groups.

Figure 31 - Core competencies for contemporary Army operations

The core-competencies are behaviour-oriented and seek to take into account the existing Army leadership doctrine, the most likely external factors to influence leadership in the future (environmental, social, geopolitical and economic) as well as contemporary leadership theories (Horey et al, 2004: 4).

The model was assessed using Subject Matter Experts (SME) and a field validation process where the proposed competencies were rated on average 5.6 on a 7 (7=highly important) point rating scale by a random sample of 56 U.S. Army majors (Fallesen et al, 2004: 9).

This part of the chapter has presented different definitions of competency where *"an underlying characteristic of an individual that is causally related to effective and/or superior performance in a job or situation"* has been the starting point for the discussion. The contemporary use of competencies, which also has been illustrated throughout this section, is often manifested in competency lists, competency models or similar approximations. General management competencies such as technical-, people-, and conceptual skills have been presented as well as the managers' interpersonal, decision-making and information role.

The public sector distinguishes itself the from private sector on a number of issues, regarding both fundamental questions such as purpose as well as some other desired clusters of competencies. Despite of these dissimilarities, one of the greatest objectives of public sector reforms in the last decades has been an approximation towards private sector principles such as marked mechanisms and output orientation. This in turn has resulted in new demands on the public manager, particularly in the way of being more entrepreneurial and acting more marked-minded.

The next step of this dissertation aims to explore the second main part of this chapter, the development of a meta-competency model for leadership in complex military systems.

7.2 Development of a Meta-Competency Model for Leadership in Complex Military Systems

The purpose of this section is to discuss the development of a meta-competency model for leadership in a complex military system. This section is divided into three topics for discussion: background, framework and meta-competencies.

It is the aim of the section entitled background to repeat briefly some of the rationale behind the model development in terms of global trends and contemporary military development. This is followed by an analysis of the results presented in the previous chapter, which together with other empirical research on the Norwegian Armed Forces will illustrate the need to develop the individual officers' as well as the organization's adaptive properties.

The framework for the development of a meta-competency model criticizes the contemporary definition of competencies as being inadequate for use in a complexity setting and will therefore propose a new definition. This is followed by a discussion around the contemporary use of competencies as presented in the first part of this chapter, highlighting some possible shortcomings and pitfalls.

Meta-competencies are presented as a promising and flexible guiding mechanism in a complex setting, which takes into consideration a number of the shortcomings linked to contemporary approaches to competencies.

Finally, this section ends with a short review of those competencies highlighted in the literature as important in contexts related to complexity, for instance environments of innovation, creativity, change and transformation.

7.2.1 Background

Globalization, rapid changes in technology, and demographic trends are all important factors that contribute to conditions in which organizations must learn to adapt (O'Brien & Robertson, 2009, 372-373). A myriad of connected and interdependent agents generates a high pace of change (Hamel, 2007) and great deal of uncertainty, irrespective of sector, size and location (O'Brien & Robertson, 2009, 371).

Simultaneous to a demand for greater adaptive capacity, new demands on organizational leaders for transparency, societal contribution and corporate social responsibility are emerging (Järvalt & Veisson, 2005: 1; O'Brien & Robertson, 2009, 372). At the same time of the emerging complexity, a comprehensive study by IBM reveals that a surprisingly high number of leaders, and in particular public sector leaders, feel ill-equipped in meeting the requirements of a significantly different world (IBM, 2010: 4).

Walker (2006) illustrates (in figure 32) some of the changes in context that have emerged during the last decades. The macro trend identified is a shift from a work-oriented to a worker-oriented environment where the individuals' properties and qualitative aspects are of greater interest than the occupation/task and quantitative mechanisms. From this it follows that a contemporary context requires a greater magnitude in addition to a more diverse role repertoire of leaders.

A CURRENT CONTEXT FOR CHANGE		
	Work-Oriented	Worker-Oriented
Era	Modern	Postmodern
Toffler Wave	Industrial	Information/Knowledge
Theory	X, Domination	Y & Z, Reciprocal Relations
Icon	Henry Ford, Fred Taylor	Bill Gates, Steve Jobs
Org Chart	Hierarchy, Bureaucracy	Matrix, Networks, Pods
Stereotype	Brawn: Assembly Line	Brains: Hi-Tech, Degrees
Job Location	Steel Plant, Factory	Software Design Offices
Job Framework	Org Chart/Job Description	Goals, Projects, Change
Job Info/Detail	Tasks, Time x Percentages	Knowledge, Attributes
Process/Detail	Occupational/Job Analysis	Competencies, Skills
Leader Power	Positional, Role/Rank	Personal, Exemplar
Leadership	More Transactional	More Transformational
Military Profession	Warrior + Technician	Warrior + Technician + Scholar + Diplomat

Figure 32 - Changing context (Walker, 2006: 21)

The challenges offered by a globalized community and rapidly changing circumstances affect military organizations in many ways.

Military organizations are expected to master a wide range of operations from humanitarian disaster relief to more regular war-like situations in a joint- and multinational framework (Chan, 2006: 2), and often within strong jurisdictional and political constraints. The NATO-report “Multinational Military Operations and Intercultural Factors” by Febrarro et al further states that nations in a multinational framework often have different organizational rules and different applications of these rules, which may increase the complexity of the operation (2008: 9-2). The Strategic Trends Programme by the British Ministry of Defense (2010: 16) highlights that a multinational framework also requires interoperability between military forces, other arms of state and non-state actors such as non-governmental organizations (NGO), contractors and international institutions, organizations of which often have a dramatically different *modus operandi* than military organizations (Febrarro et al, 2008: 9-2).

The context of a majority of military operations is often asymmetric with blurred boundaries and consequently difficulties in prediction (Kit, 2008: 1-2; McCausland, 2008: 87). The Strategic Trends Programme further substantiates this perception of uncertainty by stating that:

"The character of conflict will continue to evolve, remaining innately volatile. State and non-state actors will seek to combine conventional, irregular and high-end asymmetric methods concurrently, often in the same time and space and across the combined domains of the air, land, space, and cyberspace. Conflict is likely to involve a range of transnational, states, group and individual participants who will operate at global and local levels" (2010: 13).

The present (2011) Norwegian Defense Chief, General Sunde, characterizes contemporary and future conflicts as complex, difficult to follow and in a constant state of flux. He further states that the need for adaptive capacity is greater than ever before, taking into consideration the complexity and dynamism of the threats (Sunde, 2010: 3-4). This implies a required military transformation process from conventional warfare to operational adaptability that necessitates a flexible mindset from leaders on all levels and competencies supporting collaborative planning and decentralized execution (Daltveit, 2010: 18; Strategic Trends Programme, 2010: 17: NATO, 2010: 1).

Military operations are currently in need of something more than just traditional war-fighting military capacity. Complex crises such as Kosovo, Iraq, Afghanistan or any other conflict for that matter, illustrate that it requires an approximation which integrates military, social, economic, political and environmental aspects to deal with long term challenges (McCausland, 2008: 89). Put differently, traditional military means such as the use of force *should* only be one of many tools in the toolbox of military leaders.

Let us now continue by having a look at what empirical research has revealed concerning Norwegian Military officers and their competencies for a complex milieu.

7.2.2 Norwegian Military Officers and Competencies for a Complex Environment

The purpose of this section is to highlight that there is a need, and to some extent a desire, among Norwegian Military Officers to develop adaptive competencies for a rapidly changing, unpredictable and complex world.

Hence, this section serves as some of the foundation for the development of a meta-competency model for leadership in complex military systems both in terms of legitimizing or rationalizing the need for such an approximation (normative), as well as in terms of specific contribution to the content of the model (descriptive).

The basis for the claim that Norwegian Military Officers need to develop their adaptive competencies is verified in various research and empirical findings using Norwegian Military

Officers or the Norwegian Armed Forces as the subject of study. However, this claim is modest as neither this investigation nor any other research can legitimately conclude the absolute truth about how Norwegian Military Officers are, how they act and how they think. A claim such as this, it may be argued, would be assertive and irresponsible. Consequently, this section will present *indications* or *possible patterns* of how Norwegian Military Officers act and think related to the topic in this dissertation, complexity.

Two main patterns will be presented in this section. Firstly, that homogeneity and homogenous thinking are nourished both from an individual as well as from a systemic perspective and secondly, that despite to some degree acknowledging the *need* for adaptive properties (normative), their behaviour and attitude (descriptive) suggests otherwise.

This section does not provide an extensive normative discussion of whether the patterns identified are favourable or not. This will be discussed in more detail in the section that deals with the specific meta-competencies in chapter 8.

Let us continue with a discussion of the first pattern of homogeneity and homogenous thinking.

7.2.2.1 Patterns of Homogeneity

It might be fruitful to make some distinctions in the discussion around homogeneity. First of all, one could approximate it from an institutional perspective by debating what mechanisms the institution as a system uses to promote homogeneity (formally or informally). For instance, one could argue that a high degree of formalization and standardization, in addition to clear prescriptions of what behaviour is expected on different levels of the hierarchy (Wong et al, 2003: 659), stimulates homogeneity, as often is the case with military organizations (Soeters & Recht, 1998: 171; Kirkhaug, 2008: 22-24).

Secondly, one can link it to the patterns of thought and behaviour from individuals within the institution (Ellingsen, 2008*c*: 93). In this context it is important to emphasize that when discussing patterns of homogenous thinking the focus is therefore not on the *content* itself (what the role players think *per se*) but the fact that large groups within the institution have a great deal of *similarity* concerning patterns of thinking or behaviour.

One of these patterns of similarity may be referred to as a “military mind”, that is, a particular way of thinking which is linked to military organizations. According to Huntington (1957) and Abrahamson (1972) the military mind can be identified as *nationalistic*, *alarmistic*, *conservative* and concurrent with a *negative perception of human nature*, which according to

empirical research by Norland (2007), are also characteristics representative of the majority of Norwegian Military Officers.

A *second* pattern of similarity is linked to traits of military leaders, where a meta-analysis conducted by Judge (2002) suggests that an effective military leader scores relatively high on extraversion and conscientiousness, and relatively low(er) on neuroticism and agreeableness (Nordvik, 2005: 148). A study of junior military Officers in the Norwegian Royal Air Force characterizes the group as relatively homogenous in terms of these personality hallmarks (Hansen & Larsen, 2006: 49), a trend which is supported in similar studies by Nordvik (2005: 156) and Sørmo (2002) on Cadets at the Air Force branch of the Norwegian Military Academy.

Thirdly, homogeneity (and heterogeneity) is related to demographic variables (such as gender, age, location) and the distribution of these factors. Although not a very relevant way of thinking about homogeneity, this dissertation argues, it is the most prevalent. The Norwegian Armed Forces, similar to practically all other military organizations, has an uneven gender distribution, with only approximately 8.0% women, something one can argue promotes homogeneity. In a comparative study between US Army and Norwegian Army women, Netland (2004: 31) points to the fact that the Norwegian Army (and Norwegian society in general) have relatively few minority groups, something which again affects the diversity of the organization.

In the context of the Norwegian Armed Forces it is worth noting that empirical findings seem to indicate that the institution reinforces a homogenous trend.

Research conducted by Drake and Solberg (2004), Grindal and Ovesen (1999), Kristiansen, Boe, Bakken, Skjæret and Granlund (2008) indicates that the culture in the Norwegian Armed Forces inhibits the integration of women in the military profession and that attempts to create diversity in the organization are scarce and poorly promoted by leadership (Kristiansen, Boe & Skjæret, 2010: 3). A study on NATO and the gender gap in the Armed Forces concludes that despite being one of the top initiators of gender projects, the Norwegian Armed Forces is one of the least successful nations securing female personnel in its armed forces (Schjølset, 2010).

These trends is further substantiated by findings from Brundtland et al (2009:3) who highlight that "*being a woman in the Norwegian Armed Forces is from the research projects experiences often negative, distinctive and repetitive over time."* Aambakk (2007: 80) states that compared to civilian leaders and other public sector leaders, it is the military leaders who in relative terms mostly downplay the importance of balance in gender composition in the

organization. Aambakk argues that one can question whether Norwegian military leaders see the benefit of greater diversity within the organization (Aambakk, 2007: 80), a hypothesis supported by empirical research by Hovde (2010) at the Norwegian Joint Staff College. Diversity is, as suggested by a pilot study on culture and diversity in the Norwegian Armed Forces, primarily connected to challenges of adjustments of food requirements and possibilities of religious practice for personnel with a Muslim background (Ellingsen, 2008*c*: 93).

A socio-anthropological study by Totland (2009) conducted at the Telemark Batallion in the Norwegian Army concludes that the soldiers emphasize masculine physical properties as central values in creating an operational environment and that the fellowships created are highly masculine. The same pattern is recognized in a similar study conducted at the Royal Guards (Harsvik, 2010). Lundstein (2009: 61) and Haaland (2008: 170) further illustrate that the emergence of a highly masculine environment is reinforced by the fact that women in the Norwegian Armed Forces adjust or suppress their behaviour to fit into a male-dominated culture with the aim of being accepted.

An international comparison of culture and discipline at 18 military academies conducted by Soeters and Recht (1998) suggests that Norwegian Military Cadets score high on masculinity, meaning "*the importance attached to income growth and possibilities of promotion, in comparison with job security and good working relations"* (Soeters & Recht, 1998: 173). In feminine cultures, quality of life and taking care of each other are considered more important than high salaries and promotions (Soeters & Recht, 1998: 173). A masculine (and perhaps circumstantial discriminating) approximation is further substantiated by a study conducted on 1147 officers in the Norwegian Armed Forces and claims that male officers in general perceive female officers to be less capable than themselves to conduct both leadership, practical tasks and combat related positions (Hjelmeseth, 1994: 161-163).

However and as earlier noted, homogeneity or heterogeneity should be understood in a far wider perspective than merely gender composition and gender roles. Nissestad (2007) investigates the effectiveness of the leadership development program at the Royal Norwegian Naval Academy (RNoNA) and its impact on preparing officers to execute leadership in today's conflicts and the conflicts in the years ahead. In terms of homogenous *patterns* and institutional mechanisms his findings can be summarized as follows:

- The results from the empirical surveys which focus on cultural aspects reveal relatively little variation in responses, thus indicating a homogenous culture (Nissestad, 2007: 218).

- The reward system of the RNoNA reinforces the *status quo* by remunerating an authoritarian leadership style and strengthening the existing culture (Nissestad, 2007: 243, 246).
- The facilitators at the RNoNA do not have the capacity or the will to help the teams challenge their role structures, something which limits the individual Cadets' ability to increase their maturity level (Nissestad, 2007: 245).
- The results from the empirical survey also indicate that in terms of recruitment the organization attracts a relatively narrow variety of people which are attracted to an organization with an outdated identity (Nissestad, 2007: 286).
- The results regarding culture at the RNoNA appears to be *relevant across all services* and ranks in the Norwegian Armed Forces (Army, Navy, Air) (Nissestad, 2007: 224-225), something which illustrates how deeply embedded these patterns are and the magnitude thereof. Studies by Fauskanger (2006), which investigates the coast guard, and Larsen and Johannessen (2005) investigating the sub-mariner community are additional studies that support these findings (Nissestad, 2007).

An empirical study in the Norwegian Army that examines the relationship between military organizations and the perception of organizational politics and organizational political skills reveals that Norwegian Army officers have a very low or neutral level of perceived organizational politics, something one finds in organizations where there is a high level of rules and policies (Lundberg, 2008: 76). The study also concludes that there is no difference in the officers' perceived political skills taking into consideration the age and organizational level of each officer (Lundberg, 2008: 77), something one could argue supports a homogenous pattern.

Although the empirical findings presented in this section highlight homogenous patterns as a relevant pattern in the Norwegian Armed Forces, there is simultaneously an *awareness* among leaders of the need for diversity (from many perspectives). Former Commanding Officer of the Norwegian Army, General Robert Mood states the following:

"Contemporary challenges demand more. Not only is a broader platform to lead from required, but also leaders with different perspectives must be integrated. Simultaneously, teams must be made up of individuals who complement the holistic picture in comparison with merely worshiping homogeneity. All leaders, irrespective of level, must seek to nurture diversity in the organization and let this diversity live out in order to create a broad and sustainable foundation to manage a wide spectre of scenarios"[23] (Mood, 2007:11).

[23]Translated by the author of this thesis from Norwegian to English.

The findings presented in this section regarding homogenous patterns seem to be congruent with the findings of this dissertation. As presented and discussed in Chapter 6 the macro pattern of responses, irrespective of branch, level of education and educational institution, reveals a homogenous pattern of responses.

This section has presented and discussed how patterns of thoughts or behaviour from individuals in the Norwegian Armed Forces reveal a homogenous trend. Simultaneously, some general and specific institutional mechanisms such as structure and demographic variables have been highlighted and linked to the promotion of homogeneity.

We now continue by presenting and discussing normative and descriptive aspects concerning the relationship between Norwegian Military Officers and complexity.

7.2.2.2 Norwegian Military Officers and Complexity

This purpose of this section is to provide empirical findings to support a view that Norwegian Military Officers lack a number of the necessary competencies to respond adequately to complexity and simultaneously (but briefly) to note some systemic deficiencies of the Norwegian Armed Forces regarding adaptive properties.

Before discussing the competencies of Norwegian Military Officers this dissertation will highlight some of the findings from its empirical research which indicate that from a normative point of view Norwegian Military Officers are *aware of* and to some extent *acknowledge* the complexity of their organization and the context in which they as leaders are required to operate.

In reference to the results from the survey regarding the Norwegian Military Officers' relationship to general complexity principles and a Complexity Approach to leadership as discussed in chapter 6, the following bullet points may be highlighted:

1. The Norwegian Armed Forces is perceived to be an *open system,* i.e. a system which interacts consistently and dynamically with its environment and consequently has unclear boundaries.
2. The Norwegian Armed Forces operates in a highly unpredictable and uncertain environment.
3. In order adequately to respond to this highly unpredictable and uncertain environment there is a widespread belief among the respondents that one constantly needs to adapt.

4. There is an attitude among the respondents, in particular the participants from the Joint Staff College, that decentralization and change[24] is something positive.
5. There is an extensive belief that emotional intelligence is far more important than technical intelligence.
6. There exists among the participants a strong belief that abstract thinking is a highly important leadership trait.

As indicated previously the attitudes and beliefs presented in these bullet points are congruent with a Complexity Approach as it is presented in chapter 3 and 4 of this dissertation. There exists, however, a relatively profound divergence between the normative aspects, i.e. the points presented above, and the descriptive reality, i.e. the manner in which one is to achieve this adaptation or to what extent the present competencies of the Officers support the desired normative state. For instance, a study by Billing and Nordang (2002) mapping the organizational culture of the Norwegian Air Force notes that while the Air Force as an organization desires innovation and creativity on the one hand, the means of assessing success lies in the measurement of criteria based on control and rule based thinking (thus a huge gap between the normative desire and descriptive reality) (Hellemsvik, 2002: 57).

Let us elucidate this claim by further discussing the empirical findings.

Gamst (2008: 4) and Pettersen (2007: 70) argue that due to increased complexity in operations and a more interconnected working environment, the competency requirements for Norwegian military officers and for the Norwegian Armed Forces as a system have changed. According to Nissestad (2007: 43) the intention of educating officers must be to ensure leaders that are capable of dealing with *"the types of unstructured, rapidly developing "asymmetric" situations that most strategists predict will characterize future conflicts".*

The findings of Nissestad, however, reveal a closed military culture which lacks the "*qualities of variety, rapidity, and initiative*", something that may be characterized as some of the features needed to develop adaptive properties for both individual and system (Nissestad, 2007: 228). Døhl (2005: 57) further states that structure, control systems and the culture of the Norwegian Armed Forces, point to an organization in stagnation.

[24] On the factor of *change* a relative majority of the respondents from the Norwegian Military Academy(48.3%) identify change as something negative.

In reference to the topic of this dissertation, the most significant *isolated* cultural value identified in the research of Nissestad (2007) is "uncertainty avoidance" which refers to "*the extent that members of collectives seeks orderliness, constancy, structure, formalized procedures, and laws to cover situations in their daily lives"* (Nissestad, 2007: 226). What may be considered a need for rationalization is further supported by the findings in this dissertation, where the respondents from the Norwegian Joint Staff College and Norwegian Military Academy (Rønn, 2009) believe that rational mechanisms such as long term planning, goal orientation and prediction are crucial to achieve success. Nyhus (2001: 10) claims that the perception of the ideal officer has been dominated by a view of the officer being a rational and calculating warrior. Rationality has been regarded as the strength of the man, while feelings have been considered to be the weakness of the woman.

Although the research of Nissestad (2007) suggests that the respondents have a high level of uncertainty avoidance, there is empirical research that indicates otherwise. A study by Soeters and Recht (1998) for instance indicates that Norwegian Military Cadets' tendencies to avoid uncertainty are relatively low, something which is in line with findings of Geert Hofstede (2001) who reports that Norwegians (in general) score moderate to low on uncertainty avoidance (Strand, unknown: 294). Interestingly enough this divergence *may* however, also indicate that the Cadets have developed somewhat towards an attitude of *less* tolerance for uncertainty (taking into consideration the time span between the studies) and/or that they differ from the general population.

The results from Nissestad (2007) also indicate that the social interaction patterns at the RNoNA are highly static with fixed roles within the teams (Nissestad, 2007: 248), something one might argue further contributes to a tendency towards avoiding uncertainty. An analysis of the Cadets' learning style indicates that 37.1% of the respondents can be categorized as "by-the-bookers" where strict methodology, rules, step-by-step instructions and closure are important, whereas merely 12.1% can be identified as innovative "dreamers" who tolerate uncertainty and ambiguity (Nissestad, 2007: 256).

The apparent reluctance of uncertainty and the simultaneously strong occurrence of variables that contribute to a static learning environment is further substantiated by the Cadets' lack of role-taking ability and low score on openness (Nissestad, 2007: 254, 256). Additionally, 41.8% of respondents are "resolute believers" (strong and unchanging beliefs about social policies and personal morality) and 18.1% are "traditionalists" (family values, ideological values from childhood), whereas only 22.0% are considered to be free thinkers (Nissestad, 2007: 258). A limited role repertoire and a tendency towards reinforcing the

existing paradigm will significantly affect the individual's ability to adapt and consequently restrict the group or system's ability to perform in highly unstructured situations (Nissestad, 2007: 254).

As noted previously, the generic profile of a military officer is often connected to a relatively moderate or low score on agreeableness, i.e. the domain of inter-human relations such as communication, trust and morale. People that have a high score are often characterized as sympathetic and co-operative, whereas a low score is often connected to egocentrism and competition (Hansen & Larsen, 2006: 23, 47). A study of junior officer cadets in the Royal Norwegian Air Force suggests that agreeableness is the weakest factor among the respondents and that they score relatively low on this factor (Hansen & Larsen, 2006: 37). A similar study with officer cadets as the sample suggests a similar trend among the male officers[25] (Nordvik, 2005: 153). Additionally, a comparative study of Norwegian Navy Academy Cadets and U.S. West Point Cadets reveals that the samples rank "social intelligence" as moderately important (11 out of 24 and 12 out of 24) (Matthews, Eid, Kelly, Bailey & Peterson, 2006: 65).

These findings may be linked to one of the findings from the empirical survey of this dissertation which illustrates that a significant majority of the respondents describe their leadership style using metaphors related to a "traditional", "hard" and "masculine" approximation and consequently a marked minority uses "complexity", "soft" and "feminine" images to illustrate their leadership style.

Although the majority of empirical findings presented in this section are mainly related to the level represented by the educational institutions of the Armed Forces (Junior Officer training, Military Academies and Joint Staff College) there are some (but in number limited) studies dedicated to an investigation of the top level leaders and their competencies.

In an empirical study of military culture in the Royal Norwegian Air Force Hellemsvik (2002) investigates how top leadership (Colonel and higher) of the Air Force is perceived by their fellow officer colleagues. The sample consists of 185 officers ranked Lieutenant/Captain and 110 officers ranked Major/Lieutenant-Colonel. Using the Norwegian Armed Force's Value Foundation (Norwegian: Forsvarets Verdigrunnlag) as the comparative basis, the author concludes that there are *considerable gaps* between what the value foundation describes and how the top leadership is perceived, more specifically that *a significant number* of the top

[25]The female respondents score considerably higher on the factor of Agreeableness in this study.

level officers (thus not all) lack essential strategic qualities[26], integrity[27], cooperation skills[28] and stress management skills[29], all competencies of which are highly relevant for a complex environment. Mæland (2004: 300-301) notes that in an operational environment characterized as diverse and complex, emotional and philosophical capacities are desired and required, whereas Hellemsvik (2002: 121) states that the limited focus on the philosophical, political and strategic domains will increasingly become a weakness for the Norwegian Armed Forces.

As described earlier in the findings of Nissestad (2007), the leadership development program at the RNoNA has not been based on a philosophy congruent with the requirements of a complex environment and consequently a considerable number of the Cadets do not possess the desired competencies required by a milieu characterized as uncertain, ambiguous and dynamic. A study by Sandnes (2007), in which the relevance of the education of officers at the Norwegian Military Academy (branch of Army) related to a context of international operations is examined, concludes that the Military Academy is heavily restricted by its own traditions and has showed little determination in adjusting to a new context. Despite indications in White Paper number 38 in the late 1990's of a wider international focus, there have been small adjustments in the education manuals of the Norwegian Military Academy (Sandnes, 2007: 71). There is widespread and uniform agreement among the respondents in the research that the Military Academy has been able to adjust the education regime to a minor degree in a context which is characterized by increased complexity and an international operational setting (Sandnes, 2007: 72). The trend of inadequate- or lack of - education and training for an international context are further substantiated by the empirical findings of Gussiås (2009: 5, 66-67) and Trettenes (2009: 76-77).

A research report from the Norwegian Institute of International Affairs (NUPI) by Trine Holo and Morten Dehli Andreassen (2010) investigates the Norwegian Defense Forces' perception and management of cultural understanding in an international operations' context.

The report has three conclusions of particular interest for this dissertation. First of all, the authors highlight that the soldiers and officers of the Norwegian Armed Forces have a

[26] In this study defined as being *visionary, exhibiting good strategic skills and comprehensive competency management* (see Hellemsvik, 2002: 133).
[27] In this study defined as strong *character and independent, high ethical consciousness, courage to go against the flow* (see Hellemsvik, 2002: 142).
[28] In this study defined as *showing equality and respect, display loyalty, enabling trust, providing feedback, exhibit initiative, defining objectives and acceptance of others' competencies* (see Hellemsvik, 2002: 143).
[29] In this study defined as *functioning well as a leader under considerable pressure* and providing unity through leadership in situations of considerable pressure/stress (see Hellemsvik, 2002: 144).

relatively uniform perception of many military aspects which emerge through a learning process of attitudes, perceptions, behaviour and professionalism from the beginning of their military career (homogeneity). Secondly, the development of cultural understanding has little emphasis in the pre-deployment training stage, where basic military skills are prioritized. Third and finally, the report notes the utmost importance of adequate cultural understanding among Norwegian Armed Forces' units in international operations.

The purpose of this section has been to present *indications* or *possible patterns* of how Norwegian Military Officers act and think related to the topic in this dissertation, complexity. The indications and possible patterns are, however, not explicitly unique for the Norwegian Armed Forces.

Pierce (2004) paints a picture of a U.S. Army in which there are considerable gaps between the desired normative state and the descriptive reality. On the one hand, the results from the empirical research indicate that *"the Army's professional culture should be one that emphasizes flexibility, discretion, participation, human resource development, innovation, creativity, risk-taking, and a long-term emphasis on professional growth and the acquisition of new professional knowledge and skills, which is more aligned with the Army's strategic external environment*" (Pierce, 2004: 166).

On the other hand, the author concludes that the data demonstrates a relatively homogenous Army culture (Pierce, 2004: 170), in which an overarching desire for *"stability and control, formal rules and policies, coordination and efficiency, goal and result oriented, and hard driving competitiveness"* is prevalent (Pierce, 2004: 166). This trend is further supported by other research on the U.S. Army (ATLDP, 2001: LeBouef, 2002; Wong, 2002) which note that innovation and risk-taking are inhibited by an Army Profession which *"reflexively rewards stability and control and encourages excessively structured supervision"* (Pierce, 2004: 169). Findings from Reed et al (2004: 54) further indicates that the predominant personality type among War College students is one which has a *"penchant for details, specifics, early closure, and structure"* and who has a "*clear preference for objective, concrete and pragmatic solutions*". Research from Belanger (2010) on the Canadian Officer Cadets reveals a similar homogenous pattern in terms of leadership behaviour and personality.

This section has demonstrated two possible main patterns. The first is related to the promotion of homogeneity, in for instance how institutional mechanisms, organizational culture, patterns of thought and demographic variables nourish *status quo*. The second pattern reveals a relatively distinct difference between the desired normative state and descriptive reality, more specifically that complexity is *acknowledged* but the mechanisms to

adapt to complexity is prevalent to a lesser degree. As noted by Nissestad (2007: 258), there are *"too few adapters and too many rigid and inflexible officers".*

The next step in this dissertation is to present and discuss the framework for a meta-competency model for leadership in complex military systems.

7.2.3 The Framework of a Meta-competency Model for Leadership in Complex Military Systems

At the start of this chapter different definitions of competencies were discussed and it was indicated that the commonly recognized definition of competencies, "*an underlying characteristic of an individual that is causally related to effective and/or superior performance in a job or situation"* (Thach & Thompson, 2007: 357; Briscoe & Hall, 1999: 37), may not be an adequate description interpreted from a complexity point of view.

The first objective of this section is thus to propose a novel definition of competencies more relevant to a complexity understanding. Thereafter this section will discuss and criticize the contemporary use of competencies before finally proposing meta-competencies as an appropriate guiding mechanism in a complexity setting.

7.2.3.1 Towards a New Definition of Competencies

To begin with, it may be useful to provide a basis for the hypothesis as to why the commonly recognized definition of competencies is not adequate in a complexity framework. Here a number of fundamental challenges will need to be articulated.

The first challenge is the use of the singular noun "a characteristic". The reason for labelling that specific use as a challenge is that it is unclear whether one could say that *one isolated characteristic* leads to a certain outcome. It is more relevant and more likely, this dissertation argues, that the outcome is a product of the *interaction between multiple characteristics* (which may or may not be identifiable).

The second challenge is linked to the organic component of the definition, that is, the "individual". It is not a challenge in the sense that "an individual" is *not* a relevant agent in a complexity setting, but rather that "an individual" is *not the only* relevant agent. Of similar or even greater importance are the characteristics of the *collective system*, the characteristics that are developed, and constantly emerge though the local interaction between agents.

The third challenge may be found in the articulation of *causality* between characteristics and performance. As promoted by this dissertation, identifying causality is a difficult and sometimes impossible methodological exercise in an interconnected and dynamic environment (although it may be perfectly suitable in a simple or complicated environment). Of course, one may claim to identify valid causal links between variables, and justify these by correlations and numbers. However one cannot escape the reality that an approach such as this one is based on reductionism and closed system thinking. The definition of the variable itself may be a complex exercise as characteristics and performance may be abstract and difficult to quantify. It is less of a challenge to establish causality in physical circumstances (behavioural competency); a good illustrative example would be where your hand hits a brick wall. It is however extremely difficult or nearly impossible to determine precisely the intricate and complex cognitive processes that lead to the decision of hitting (the interaction between underlying characteristics and the history of the system). Thus, this dissertation argues that when talking about competencies, which inherently is something organic and living, it is of questionable relevance to speak about causality and certainties, but pertinent instead to emphasize *probabilities and the emergence* of reality through interconnection and co-existence.

The fourth and final challenge is connected to the claim that a competency is causally related to "effective and/or superior performance". The first aspect to discuss may be to consider what is understood by *effective* and/or *superior*. A Newtonian and Complexity approximation will most likely have a different perception of what is effective or not, but one needs a more precise contextual reference to carry this discussion any further. The second feature this dissertation questions is why a competency is only considered a competency when it is (seemingly) correlated with something effective and/or superior. To start off with, it is difficult to determine the causality between the competency and what is effective and/or superior (with regards to the discussion above) and secondly the non-linearity of the complex system's dynamism leaves it "out in the blue" whether the emergence is good or bad. For the purposes of this dissertation a competency may be regarded as a competency irrespective of the outcome. The third facet to comment on is the notion of performance, or described more correctly, the urge to *measure performance*. It is not wrong to *evaluate* performance *per se*, but one should at the same time be aware that the defined optimized standard one uses as a basis for comparison is not always relevant as a comparative value in a highly contextual and dynamic environment (unless it is a simple or complicated system). Simultaneously it must be noted that it is how the system as a whole performs, and the pattern that the system produces over time, which is the most interesting factor when evaluating performance (holism), and not isolated performance of individual agents (atomism).

Based on the considerations presented in this section, and for that matter this dissertation as a whole, we may present the following proposal for a definition of competencies as it is adjusted to a complexity understanding:

Competencies are interconnected underlying characteristics of an individual or system, which through a dynamic and non-linear process of interaction between local agents and the environment contribute to the emergence of identifiable or unidentifiable patterns of individual or systemic behaviour.

The definition itself and the above discussion leading to the definition may be sufficiently descriptive, but let us further elucidate some of the characteristics[30] of the definition for the purpose of expanding our understanding.

The first aspect that this dissertation aims to highlight here is that the definition is *modest*. The term "modest" is used to describe reflective positions that are careful about the reach of the claims being made and of the constraints that make these claims possible (Cilliers, 2005: 256). To compare, if the proposed definition may be perceived to be reflective and modest, the commonly recognized definition previously criticized may be perceived to be positivistic, deconstructive and assertive.

The proposed definition states that causality is a difficult topic, but does not necessarily rule out the possibility of its relevance. It simply argues that it is more likely that in cooperation with other competencies, competency A affects variable X (performance) in a disproportional way and where variable X is just a part of a bigger pattern (variable A, variable B, variable Z interacting). It must also be highlighted that there are degrees of non-linearity which may vary greatly from situation to situation. Some situations may be *almost* proportional and to some extent predictable, whereas some may be vastly disproportional and come as a huge surprise.

This dissertation argues that a modest claim is a *responsible* claim and acknowledges that there are great levels of uncertainty at all levels of the process. The definition is thus about probabilities and *possibilities*, not certainties.

The second aspect this dissertation aims to reflect upon is *vagueness*. One could argue that certain post-modernistic approximations only produce vague generalizations, which may be a

[30]Which by many also will be presented as criticism.

valid objection in many cases (Cilliers, 2005: 260, 262). A vague position does not, however, necessarily mean that it is wrong. If the phenomenon that the definition describes is vague (which is often the case with living organisms), an assertive and bombastic description may be directly wrong. Nonetheless, it may be *perceived* to be correct because the simplification and rationalization makes it easier for us to understand it.

An assertive position in a vague context characterized by limited knowledge evidently turns it into a question belonging in the *ethical* domain. In an open and interconnected context (thus unclear and vague) one cannot know with any certainty what effect the impact of what one leaves out of the equation will have on performance. However, this does not mean that "anything goes". A lot of knowledge about complexity and complex systems exists, although the knowledge is provisional (Cilliers, 2005: 260).

The third aspect is the one of limitations or *boundaries*. As the two previous discussion points on modesty and vagueness have indicated, there is a great deal of uncertainty connected to the definition of boundaries in a dynamic complex system. Again, to compare the two definitions presented, one could argue that the first represents boundaries of what we know, or more precisely what we *think* we know, and the latter corresponds to boundaries of *what we cannot know for certain*. In that way, the proposed definition investigates the limitations of what a competency can do or possibly cannot do. That is, the definition states that it contributes to emergence through a process of interaction, in fact that competency or cluster of competencies may be directly linked to the pattern (which may be perfectly observable, but difficult to predict). But simultaneously the definition illustrates that there are many challenges in causally connecting a competency to a given performance.

It may be worthwhile at this point to contextualize the definition somewhat.

The main parts of this chapter have been dedicated to the investigation of empirical findings connected to the Norwegian Military Officers and their relationship to complexity. There is a pronounced proposition that a number of the competencies of the Norwegian Military Officers may be linked to the modernistic or Newtonian paradigm, which has questionable or variable relevance in a Complexity Approach.

The investigation further reveals that the patterns which emerge are related to qualities which do not promote adaptive properties, for instance homogenous thinking, homogenous culture and institutional mechanisms that reinforce *status quo* and balance. The meta-pattern which emerges, as proposed in this dissertation, is a pattern in which the Norwegian Armed Forces forms a holistic point of view, is not coping well with adaptive challenges.

With the intent of further elucidating the definition, the proposals of this paragraph may be integrated into the definition in the following way:

*Competencies (*for instance masculinity*,* goal orientation, role taking ability) *are interconnected underlying characteristics of an individual* (Norwegian Military Officer (singular)) *or system* (Norwegian Military Officers (plural) or institutional mechanisms), *which through a dynamic and non-linear process of interaction between local agents and the environment, contribute to the emergence of identifiable or unidentifiable patterns* (homogenous thinking, homogenous culture, institutional mechanisms) *of individual or systemic behaviour* (not coping with adaptive challenges).

In an attempt to operationalize the definition, one could present the findings in the following manner:

Masculinity, formalization, goal orientation and low role taking ability[31] are interconnected underlying characteristics of the Norwegian Military Officer and Norwegian Armed Forces, which, through a dynamic and non-linear process of interaction between local agents and the environment, contribute to the emergence of patterns identified as homogenous thinking and homogenous culture which in turn makes the Officers and the Norwegian Armed Forces less capable of dealing with adaptive challenges as a system.

With the proposed novel definition at hand, let us now proceed with a critical assessment of the contemporary use of competencies which will shed light on the framework of the meta-competency model for leadership in complex military systems.

7.2.3.2 Criticism of Contemporary Competency Approaches

As presented at the start of this chapter, the contemporary use of competencies are often manifested in approaches like competency frameworks and competency lists, approaches which have been adopted by a large number of organizations in developed countries (Järvalt & Veisson, 2005: 2; Walker, 2006: 51; Fallesen et al, 2005: 1).

There are primarily two interlinked main arguments one can relate to the criticism of contemporary competency approaches, the first being that competency approaches are often *too comprehensive* and secondly that competency frameworks have questionable *relevance* in a dynamic environment. Let us elucidate these claims further.

[31] There are more competencies which substantiate the emergence of the patterns which are presented in this chapter. The presentation is for illustrative purposes, not a fully description of the identified competencies.

The competency framework with 55 competencies for public sector managers presented by Virtanen (2000) earlier in this chapter provides an example of a framework that may be characterized as *too comprehensive*. One cannot say that the list of competencies is wrong *per se* (the content), but the volume of the list makes it difficult to use it both as a guiding mechanism from an organizational perspective and as an individual self-assessing instrument. As noted by Wong et al (2003: 5), *"at the individual level it is difficult to assess one's leadership ability when the lists suggest that a strategic leader must be, know, and do just about everything".* Reed et al further state that detailed competency mapping is a mechanistic and bureaucratic approach to leadership development which leads away from the path of developing the agile, adaptive and self-aware leader we need and want (2004: 48, 53).

The argument of too comprehensive lists is closely connected to the second claim that the contemporary use of competency frameworks are of questionable relevance. However, let us first moderate the claim of questionable relevance.

In an environment which is predictable and stable, and where the essential purpose of the system is to effectively and precisely produce the same product again and again, a pre-designed and detailed list of competencies (which is anticipated to be causally linked to effective and/or superior performance) may - or more precisely - will find its application. In other words, in closed and mechanistic simple or complicated systems, the capability of reproduction and compliance of standardized human behavior are highly important stakeholders.

Complex systems are, however, not closed and mechanistic, but *open and dynamic* systems that favor and necessitate *adaptive* properties above standardization and formalization. In light of this let us review some arguments against the contemporary use of competencies[32].

- Competency modelling often results in simple list making which rapidly becomes outdated due to changes in the external environment or internal changes (Järvalt and Veisson, 2005: 3).
- Simultaneously, a number of competency approaches includes predicting a set of leadership skills and competencies for a forecasted future (Schwartzman, 2003: 64) which is dangerous for two reasons. One, the mental process of prediction is a hazardous exercise with (interestingly enough) unpredictable consequences and two; the

[32] There are of course many different approaches to the use of competencies and there may well be criticism presented in this thesis which is not relevant or have less relevance for some of the approaches.

anticipated advantage of change to accommodate a prediction may end in disaster when the prediction turns out to be wrong.

- A single set of characteristics are believed to adequately describe effective leaders (Hollenbeck et al, 2006: 399). Competencies do, however, extend beyond precisely defined (and measurable) competencies and integrate abstract knowledge such as experience and intuition (Reed et al, 2004: 48).

- A list of characteristics rarely capture the ambiguities and paradoxes of human nature (Reed et al, 2004: 54) and seldom emphasize the potential of the interaction between different competencies (Hollenbeck et al, 2006: 407).

- The development of competency frameworks has the potential to become trapped by its own learning processes. The existing paradigm may have been institutionalized to the point where the need for adaptive properties is ignored on behalf of deeply embedded values (Reed et al, 2004: 52).

Perhaps the most significant pattern one can extract from the review of the criticism is a need to shift from a focus using competencies in light of reductionism and determinism, and to highlight instead the use of competencies related to the development of adaptive properties. The integration of meta-competencies as a guiding mechanism serves as a promising approximation, something that will be discussed in the next section.

7.2.3.3 Meta-Competencies as a Guiding Mechanism in a Complex Environment

The word “meta” is a prefix which in epistemological terms refers to *about* (something), that is, an indication of a concept of another similar concept (Microsoft Encarta, 2008 (21)). For instance, a meta-study is a study of studies and meta-analysis an analysis of many analyses. “Meta” can also be used in a slightly different manner, that is, in which one describes another concept (and not itself), for instance meta-knowledge is not necessarily linked to the knowledge itself (the exact properties), but to the processes acquainted to acquiring knowledge.

In competency literature, the most recognized and used definition of meta-competencies is described as “*a competency that is so powerful that it affects the person’s ability to acquire other competencies”* (Zook, 2006: 6; Schwartzman, 2003: 63; Briscoe & Hall, 1999: 37). Jokinen (2005: 203-204) presents a similar definition (in meaning) where meta-competencies

are presented as higher order competencies defined as *"personal attributes which underpin, and determinate how and when, knowledge and skills will be used".*

This dissertation acknowledges the definition presented by Zook (2006), Schwartzman (2003) and Briscoe and Hall (1999), but simultaneously recognizes the need to integrate a systemic perspective in the definition. The following definition of a meta-competency is therefore proposed:

A competency that is so powerful that it affects the person's or system's ability to acquire other competencies.

Zook (2006: 48) presents "reading" as an analogy of a meta-competency or higher order competency which will affect the ability to acquire other competencies. For instance, the ability to read is quite an essential aspect of an individual's life if one is to function in modern society, whether it is acquiring knowledge, developing cognitive skills or using sophisticated technology.

Let us explore some of the potential advantages of using meta-competencies.

One, meta-competencies are portable across artificial boundaries such as time, level of authority, level of responsibility and unforeseen situations (Horey et al, 2004: 2). It is thus a flexible approximation.

Two, a set of meta-competencies (whether it promotes specific contexts or "conditions") provide a common language for the organization and may function as an *expression* of what one finds important.

Three, it may direct efforts of leadership development with the aim of stimulating individuals' extended capacity of reacting adequately to complexity (Wong et al, 2003: 5).

Four, the use of meta-competencies facilitates the process of self-assessment (Wong et al, 2003: 5).

Five, meta-competencies are tools which both integrate top-down and bottom-up thinking. On the one hand it provides guidance of what one expects or desires (top down), but in a relatively open and flexible way. On the other hand it may stimulate and facilitate bottom-up processes as points out a specific direction.

In many ways one could say that using meta-competencies in a proper way potentially has the benefits acquainted with a contemporary use of competencies, while simultaneously providing flexibility and versatility which contemporary approaches to competencies often are criticized for lacking.

The purpose for which meta-competency frameworks are developed must also be taken into consideration. For instance, there is considerable difference in developing frameworks for specific contexts (e.g. public manager) or what one could call “conditions” (e.g. adaptive leader). This will be further discussed in the initial phase of chapter 8.

A major part of this chapter has been devoted to highlighting the difference between the descriptive (actual) and normative (desired) reality of the Norwegian Military Officers and the Norwegian Armed Forces. From a normative perspective, adaptive properties have been highlighted as desirable, but the descriptive side demonstrates a lack of relevant competencies to fulfill the desired normative state. We have, however, not explicitly discussed what competencies one *should* have to prepare ourselves for current and future challenges. This discussion will be initiated with a short overview of what competencies the literature highlights.

7.2.4 Review of Competencies

The purpose of this short review is not to analyze and discuss the content in detail but provide some common denominators among the proposed competencies which will be beneficial for the further development of the meta-competency model for leadership in complex military systems.

The overview which is presented in table 15 is based on topics this dissertation finds relevant to the field of complexity, for instance change, “future”, strategic leadership, asymmetry, complexity, innovation and emergence.

Author	Research topic	Competency	Competency	Competency	Competency	Competency	Competency	Competency	Competency	Competency
Horey et al (2004)	*Competency based future leadership requirements*	Leading other to success	Exemplifying sound values and behaviours	Vitalizing a positive climate	Ensuring shared understanding	Reinforcing growth in others	Arming self to lead	Guiding successful operations	Extending influence	
Wong et al (2003)	*Strategic leadership competencies*	Identity	Mental agility	Cross-cultural savvy	Interpersonal maturity	World-class warrior	Professional astuteness			
Mumford et al (2000)	*Leadership skills for a changing world*	Complex creative problem solving	Social judgment	Social skills						
Williams (2003)[33]	*Competencies for asymmetric warfare*	Situational awareness	Strength of mind	Intelligent risk taking	Mental readiness	Knowing yourself and your enemy				
Williams (2003)[34]	*Competencies for asymmetric warfare*	Intellect	Intuition	Boldness	Self-reliance					
O'Brien & Robertson (2009)	*Future leadership competencies*	Authenticity	Agility	Resilience	Foresight	Self-mastery	G-localism	Intuition	Presence	Creativity
Kit (2008)	*Strategic Military leaders*	Social intelligence	Mental agility	Robustness	Ethics					
Ford (2009)	*Complex leadership competency*	Foster network construction	Catalyze emergence	Nurture systemic thinking						
Garstka (2003)	*Military innovation, leadership and cultural change*	Change leader	Innovation	Personal leadership	Results-driven	Collaboration	Strategic thinking	Influence	Problem solving	Leading people
Newlon (2004)	*Military Strategic Leadership Competencies*	World class war fighter	Technical	Influencing	Conceptual	Interpersonal maturity	Personal leadership	Improving		

[33]Leadership abilities
[34]Intellectual abilities

Chan (2006)	*Leadership development in the emerging environment*	Personal mastery	Self awareness	Self-management						
Schwartzman (2003)	*Leader development through life long learning*	Self awareness	Adaptability	Lifelong learning						
Pritchard (1999)	*Leadership of change and people in the Army*	Continuous learning	Awareness	Flexibility	Resilience	Initiative	Creativity	Entrepreneurship	Influencing others	Partnering
Jokinen (2005)	*Global leadership competencies*	Self awareness	Engagement in personal transformation	Inquisitiveness						
Järvalt & Veisson (2005)	*Leadership and competency management in the Estonian Senior Civil Service*	Credibility	Having a vision	Innovation	Leadership	Results orientation				
Thobiassen (2001)	*The properties of the military leader*	Foresight and insight	Judgment	Intuition	Creativity	Courage and determination	Self-confidence	Integrity	Communication skills	
Greenwood (2007)	*Leadership traits for the 21st Century*	Selfless service	Humility	Empathy	Doubt	Intellectual curiosity	It's all about people			

Table 15 - Competency overview

The first common denominator this dissertation identifies from table 15 is that the *language* often represents soft or "feminine" aspects. Examples could be the use of metaphors such as guiding, catalyzing, nurturing and fostering, while a more masculine approximation would perhaps use metaphors such as leading, delegating and directing.

The second set of common characteristics is the outright emphasis on *cognitive skills*, e.g. mental agility, intelligent risk taking and robustness, and simultaneously little focus on practical skills, for instance planning, organizing and evaluating.

The third pattern is the need for leaders with high *social skills*. This need is partly reflected in metaphorical use (the first point), and substantiated by phenomena such as fostering networks and catalyzing emergence which demand leaders with good social skills.

The fourth and final common denominator is that the competencies reflect a need for *adaptation*, not optimizing towards a certain future.

In the closing stage of this chapter it might also be worthwhile contemplating the qualities or habits among leaders that do *not* contribute to a comprehensive response to complexity.

In the book "Why Smart Executives Fail and What You Can Learn From it", Sidney Finkelstein (2003) investigate 51 major companies such as Tyco, Motorola, Mattel, Vivendi and AOL Time Warner and the underlying causes for failure in these companies.

The author's conclusions are that the fundamental reason for the fiasco can be found in the characteristics and habits of the people who created, organized and led the companies. The seven habits to which Finkelstein refers as *spectacularly unsuccessful people* are:

- Habit no. 1 – The leader believes that either he/she as an individual or as the company controls their environment (2003: 26).
- Habit no. 2 –The leader has issues with differentiation between what constitutes the boundaries in their personal interests and their corporation's interests (2003: 27).
- Habit no. 3 –They believe they have all the answers and push for rapid closure, not permitting emerging processes to evolve, even when appropriate (2003: 28).
- Habit no. 4 - Anyone who is not 100 % behind them will be eliminated (2003: 29).
- Habit no. 5 – They are obsessed with promoting the company image (2003: 29), looking for fast ways to improve the share prices through manipulation of media and investors.
- Habit no. 6 –Major obstacles are underestimated (2003: 29).

- Habit no. 7 – They rely on strategies and solutions that were successful for the company in a different setting (2003: 30).

A summary of the most important features of this chapter will now be provided.

7.3 Summary

The purpose of this chapter was to present and discuss the framework for a meta-competency model for leadership in complex military systems.

The presentations and discussions in this chapter are essential in order to obtain research objective 5, which is articulated as follows:

Research objective 5: To develop a meta-competency model for leadership in complex military systems.

The main findings of this chapter are linked to the different sub-objectives. These sub-objectives and the findings are listed below in summary-format.

Research objective 6.1: To describe and discuss competencies.

Research objective 6.1.1: To define competencies.

The nature of competencies makes it difficult to define precisely, but a well-recognized definition may be articulated as follows: competencies as *"an underlying characteristic of an individual that is causally related to effective and/or superior performance in a job or situation".*

Research objective 6.1.2: To describe and discuss contemporary use of competencies.

Competencies are a widely used guiding mechanism which may be presented in a number of ways, for instance as competency lists, competency models or competency frameworks.

Competencies are person-centered and may offer a "common language" for the organization. It may also be referred to as the "glue" in an organization due to the relevance of competencies across artificial boundaries such as hierarchical levels and time.

Research objective 6.1.3: To describe and discuss competencies for public management/leadership

The public sector distinguishes itself from the private sector on a number of arenas, for instance in terms of judicial constraints, ethical considerations and demands of accountability. In that way one would anticipate that the required competencies for a public manager are different from a private sector manager. Some argue that public managers should possess greater political and ethical competence, and be able to manage conflict and inspire the surroundings to a wider extent than private sector leaders. Others argue that there are comparatively small or even negligible differences between public and private sector leaders in their execution of leadership, and some highlight that there are differences between required competencies in different public sector organizations and different emphases on what is important from country to country.

The implementation of New Public Management (NPM) reforms have, however, changed the demand for competencies among public managers and speak for a wider sense of a marked-oriented mind. There exists however scepticism regarding the impact and relevance of NPM-reforms on the public sector.

Research objective 6.2: To describe and discuss the development of a meta-competency model for leadership in complex military systems

Research objective 6.2.1: To describe and discuss the background for the development of the model

Globalization, rapid technological developments and a highly interconnected environment raises questions of what competencies military leaders should have in order to cope with adaptive challenges. Asymmetry, multinational forces, international cooperation and an integration of political, environmental, economic and socio-cultural spheres are all factors that contribute to the complexity which meet military forces in current- and most likely future conflicts.

An investigation of empirical research conducted on Norwegian Military Officers or the Norwegian Armed Forces as a system, and the findings of this dissertation, reveals two relatively distinct patterns. First of all, there is considerable amount of homogenous force in the Norwegian Armed Forces, both from an individual and a systemic perspective. Secondly, the normative perspective among the respondents reveals an acknowledgement of complexity and uncertainty, while the descriptive data indicates that the officers rely on mechanisms of stability and control.

These patterns are anticipated to reinforce the *status quo* and inhibit both the individuals and system from developing an adaptive capacity.

Research objective 6.2.2: To describe and discuss the framework of a meta-competency model for leadership in complex military systems.

Assumptions of causality and an isolated individual perspective are identified by this dissertation as some of the challenges related to the recognized definition of competencies. Based on a complexity understanding of the world this dissertation proposes a novel definition:

Competencies are interconnected underlying characteristics of an individual or system, which through a dynamic and non-linear process of interaction between local agents and the environment contribute to the emergence of identifiable or unidentifiable patterns of individual or systemic behaviour.

In order to substantiate the proposed definition this dissertation includes a discussion of modesty, vagueness and boundaries, all of which are important aspects that enable us to *understand* some of the rationale behind the formulation of the definition.

Contemporary competency approaches are criticized by this dissertation for being grounded on reductionism and determinism. Approaches such as these may be pertinent in simple or complicated systems which are relatively closed and stable systems. In an open and dynamic system, however, contemporary competency approaches may fall in danger of being or becoming irrelevant and institutionalized.

Research objective 6.2.3: To describe and discuss the use of meta-competencies as guiding mechanism in a complex environment.

In competency literature, the most recognized and used definition of meta-competencies is described as "*a competency that is so powerful that it affects the person's ability to acquire other competencies"* (Zook, 2006: 6; Schwartzman, 2003: 63; Briscoe & Hall, 1999: 37)

Based on a desire to integrate a systemic perspective into the definition, this dissertation proposes the following definition:

A competency that is so powerful that it affects the person's or system's ability to acquire other competencies.

Meta-competencies represent a flexible guiding mechanism for individuals as well as organizations which acknowledge the synergy between gentle top-down mechanisms and robust bottom-up approaches.

A short review of literature on desired competencies in contexts relevant to complexity, for instance leadership of change and innovation, reveals that the common denominators are amongst others an emphasis on cognitive-, social-, and soft skills.

The next chapter will present the meta-competency model for leadership in complex military systems.

Chapter 8 – A Meta-Competency Model for Leadership in Complex Military Systems

The purpose of this chapter is to propose a novel meta-competency model for leadership in complex military systems.

Up until this point the focus of this study has been on describing and discussing different aspects of complexity and a Complexity Approach through a non-empirical literature review together with an empirical survey in the Norwegian Armed Forces. By drawing substantially on the findings in the non-empirical and empirical part of this study, the next step for this dissertation is to synthesize a Complexity Approach into a meta-competency perspective. The following research objective is therefore articulated:

Research objective 6: Based on a model-building study, to develop a meta-competency model for leadership in complex military systems.

Research objective 7.1: To present and discuss the identified meta-competencies.

Research objective 7.2: To present and discuss the interrelated and interdependent properties of the meta-competency model.

Research objective 7.3: To present and discuss the application of the proposed meta-competency model.

In order to attain research objective 6 this chapter will be organized into three main sections. The first section aims to describe and discuss each meta-competency and link it to the literature and where appropriate, the empirical findings. The second section will display the interconnected nature between the meta-competencies and how this process could possibly be modelled using the metaphor of a cloud. The third and final section will discuss the relevance of the model using different macro settings related to a military organization.

8.1 Meta-Competencies for Leadership in Complex Military Systems

The purpose of the meta-competency model for leadership in complex military systems is to enable the individual as well as the system to develop adequate adaptive properties and nourish a state of autopoiesis.

Autopoiesis refers to a fundamental network of processes that creates and renews itself in a dynamic way (Wheatley, 1999: 20), enabling and empowering leaders and systems to

develop the adequate competencies required to adapt to on-going, short- and long term challenges and lead through dynamic processes of change (Briscoe & Hall, 1999: 51).

The meta-competency model supports a state of autopoiesis by enabling a sustainable individual and institutional systemic balance between negative and positive feedback which leads to the facilitation of the system operating in what Waldrop (1992) refers to as *"the domain between linearly determined order and indeterminate chaos"*, the realm of complexity.

An autopoiesistic system is inherently an adaptive system as it evolves naturally through self-organizational processes and evolution, not through blueprints or a set of fixed plans which prescribe specific behaviour. From this it follows that a naturally evolved and adaptive system is intrinsically more robust and resilient than a system which has been consciously premeditated (Heylighen et al, 2006: 12-13).The adaptive capacity must, however, be somewhat "bounded" in the way that it develops on a slower rate than its environment, or else the identity of the system would be a mere reflection of its surroundings and exhibit no resilience.

The primary objective of the meta-competency model is thus not to describe desired competencies for a specific context, for instance change management, but rather to stimulate a desired individual and system *condition* which enables the probability of adequate responses to whatever situation might emerge. Formulated slightly differently, adaptation, "bounded" adaptation, is the pattern which *may* emerge as a result of the interaction between the later proposed meta-competencies and the environment.

One implication of this is that the meta-competency model, as any other model, is a *provisional* tool in which our understanding of the meta-competencies, leadership and complex military settings, is constantly re-negotiated as a result of each individuals' interaction with its environment (Osberg et al, 2008: 219). The meta-competency model is thus an incomplete representation of a phenomenon, but may be an important interpretive framework for gaining insight[35].

The meta-competencies and the model as a whole may be interpreted from both an individual and collective perspective, although the importance and relevance of each meta-competency might be different in the differing perspectives. Examples will be provided where appropriate throughout the discussions related to each of the different meta-competencies.

[35] Based on the interpretation of model by Allen, Strathern and Varga (2010: 44)

8.1.1 Identifying Meta-Competencies for Leadership in Complex Military Systems

The identification of meta-competencies has been subject to an emerging developmental process throughout this dissertation.

The articulation of the meta-competencies derives from the three research designs of this dissertation which have provided the basis for a process of synthesis in the current chapter (illustrated in figure 33). Let us explain this in further detail:

Through a non-empirical literature review based on a descriptive analysis of complexity and complex systems, this dissertation provides for normative approximations in terms of a Complexity Approach to leadership and context, linkages and implications from a military perspective. The descriptive and normative aspects have provided specific recommendations in terms of individual and institutional behaviour and characteristics which have created the basis of identifying meta-competencies nurturing the descriptive need and normative considerations.

An empirical survey of this dissertation together with other empirical research related to the subject of study of this dissertation, namely the Norwegian military officers and the Norwegian Armed Forces, have provided the foundation for the identification of descriptive and normative patterns of thinking and behaviour of significant direct and indirect value for the development of the meta-competency model.

The model building study aims to describe and discuss the background for the development- and the framework of the model in which a novel and adjusted definition of competencies to a complexity understanding is proposed.

The process of synthesis is subject to a structure of argumentation which both serves as an aid of identification and articulation, as well as verification of the relevance of the specific meta-competencies (figure 33).

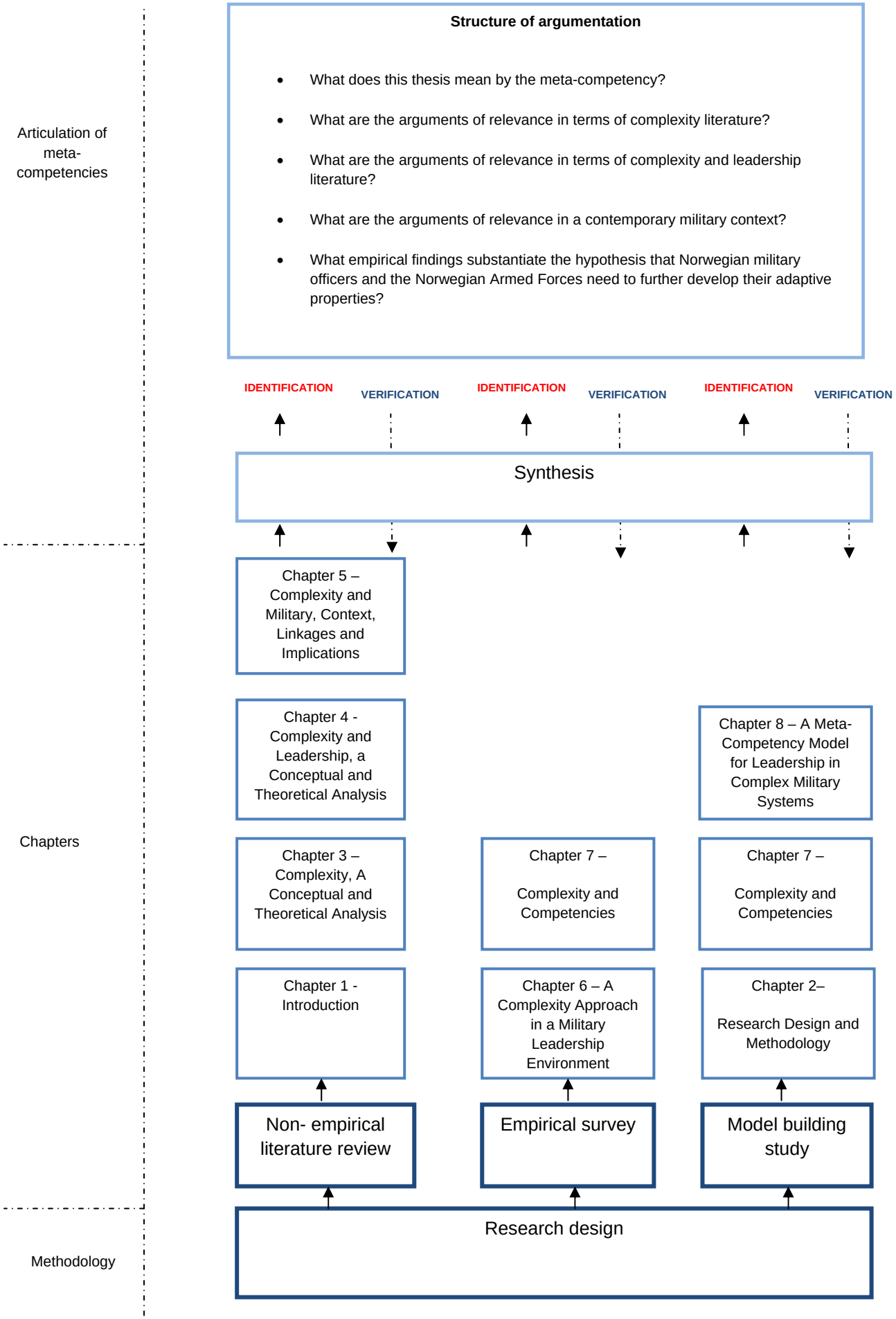

Figure 33 - The process of identifying meta-competencies

The forthcoming sections will be organized into an initial presentation of the identified meta-competency followed by a discussion with the view to answering the questions proposed in the structure of argumentation (figure 33). Parallels are drawn to the complexity literature, the complexity and leadership literature and the contemporary military context presented in this dissertation with the view to motivating why this specific meta-competency is important. Where appropriate, the meta-competencies will be related to the empirical findings in order to further substantiate the claim of relevance.

The following meta-competencies will be presented in the following order:

1. Heterogeneity of degree
2. Androgynousity
3. Cognitive flexibility
4. Ethical reasoning
5. Cross-cultural competence
6. Intuition
7. Identity
8. Courage

Each meta-competency has an annex to this chapter which provides summaries and references to specific sections of this dissertation where they are relevant.

Let us continue with the elucidation of the first meta-competency, heterogeneity of degree.

8.1.2 Meta-Competency One - Heterogeneity of degree

Heterogeneity refers to diversity or something that consists of dissimilar parts, whereas homogeneity on the other hand represents something that is uniform or the "same" throughout.

From a modernist perspective heterogeneity has often been identified as something one needs to solve and correct, whereas from a complexity point of view diversity is one of the most important resources for a complex system (Heylighen et al, 2006: 16).

The term heterogeneity is obviously relative in meaning, for instance if a group of officers is represented by all the different branches in the Army someone might say it is a heterogeneous group in composition which refers to the individual officers' variety in specialization, whereas others might argue that it is a very homogenous group because each

individual member is still an officer in a military organization. This dissertation supports the latter definition.

By using the terms *heterogeneity of degree* this dissertation states that heterogeneity is very important, and relatively much more important than homogeneity from a complex leadership perspective, but it simultaneously indicates that homogeneity should not be ignored in a holistic perspective.

It is easy to imagine how an organization that consists merely of heterogeneous agents with heterogeneous qualities and institutional mechanisms and which furthermore only supports diversity, would most likely trigger too much innovation, creativity and conflict, or described more technically, would destabilize the system to the extent to which positive feedback loops take the system into complete randomness, and ultimately, to death.

Homogeneity is thus an important source of stability in a system (Gregory, 2008: 1) and provides negative feedback to ensure that the system operates within the domain of complexity, not complete anarchy and randomness. Complex systems need some kind of structure (boundaries) to become effective, the boundaries are, however, oftentimes provisional and unclear.

The possibility of creating heterogeneity prerequisites conditions which are *out of the usual* (Kristiansen et al, 2010: 4) and conditions which can be characterized as out of the usual prerequisites creative and innovative capacity (Kirkhaug, 2008: 25).

From an individual standpoint one could argue that a *high level of education* often corresponds positively to an individual's level of heterogeneity (Warn and Tranter, 2007: 259) and that a high level of *inquisitiveness* (Jokinen, 2005: 205-206) is important in keeping an *open mind* and challenging current paradigms and limiting assumptions. Richardson et al (2000: 33-34) further argue that individuals with a high level of heterogeneity are *pluralist thinkers* who make use of *pluralist working methods* who also integrate and trust formal and informal methods, intuition and reason, and do not limit themselves to one methodological approximation. Stepping into new experiences implies a certain amount of *risk taking* and a great deal of *humbleness* and engagement in *personal transformation* (Jokinen, 2005: 205), acknowledging that expanding one's own heterogeneity is an open and dynamic process of interaction and part of lifelong learning.

We now turn our attention to the literature and the empirical findings in order to find support for the claim that heterogeneity of degree is an essential meta-competency for leadership in complex military systems.

COMPLEXITY LITERATURE

In complex systems heterogeneity might be considered to be the "fuel" of the system facilitating disequilibrium and positive feedback loops. As discussed in chapter 3, the energy of living systems (thus not simple or complicated systems) slowly dissipates in a state of equilibrium (Parker & Stacey, 1997: 3), which in turn necessitates a system condition of imbalance or movement to ensure survivability (Wheatley, 1999: 21). That is, a system must exist in a far-from-equilibrium environment in order to create a continual flow of energy (Capra, 2007; Cilliers, 1998: 4).The purpose of negative feedback mechanisms is to keep the system in balance despite changing external conditions (Johnson, 2001: 138), whereas positive feedback refers to reinforcing, amplifying and destabilizing forces (Parker & Stacey, 1997: 25-26). As discussed above, homogeneity might be considered to be negative feedback, whereas it is more natural to associate heterogeneity with positive feedback.

From a more philosophical perspective one could link the discussion around the need for heterogeneity to such broad questions as "life" and "identity". Price (2004: 40) suggests that "[life is] *a property of improbable complexity possessed by an entity that works to keep itself out of equilibrium with its environment"*, whereas Cilliers and De Villiers (2001: 235) referring to the work of French philosopher Jacques Derrida, state that *"a pure identity which is identical to itself is simultaneously identical to death*". Heterogeneity is a necessary capacity in order to survive, both from an individual and systemic institutional perspective.

Heterogeneity is not only a means of survival, but also a prerequisite for a system to *flourish*. Micro-diversity of identities engaging in rich play of difference facilitates through variation and diversity in structure a more unique and simultaneously resilient identity better capable of both *enabling* and *constraining* a system (Sturmberg & Cilliers, 2009: 882; Cilliers, 2010: 4, 14; Allen, 2010: 56).

Yet another perception of diversity is that it increases the memory of the system in the manner in which it introduces variety and richness to the structure, facilitating more available responses to a given situation (Sturmberg & Cilliers, 2009: 882) and better ability to absorb

perturbations (Juarerro, 2007: 112-113). In that sense it also develops the robustness and resilience of the system making it more adaptive.

This dissertation must, however, again propagate the importance of a balance between positive and negative feedback. A complex system is required to "forget" and "resist" some of the dynamics in its environment allowing a certain slowness in the development of a rich structure. A system that develops too rapidly will drain the system for resources (Sturmberg & Cilliers, 2009: 883). As noted by Nobel Prize winner Stuart A. Kaufmann, *"diversity drives increased diversity"* (Ulanowicz, 2010: xvi), something which underscores the fact that a chaotic condition that develops to total randomness is equally as dangerous as a static condition (Cilliers, 1998: 96-98).

Let us continue the discussion by looking at leadership related literature.

COMPLEXITY AND LEADERSHIP LITERATURE

In order to nourish heterogeneity and generally support the process of emergence, the literature on complexity and leadership highlights the role of leadership as a facilitator where the essential purpose is to *make things possible*, not necessarily *make it happen*.

A trend in the literature suggests that in order to increase diversity leaders should *disrupt existing patterns* by creating and surfacing conflict, and embracing uncertainty (Plowman et al, 2007: 344; Parellada, 2007: 166; McKelvey, 2008: 3; Uhl-Bien et al, 2007: 311; Uys, 2002 41; Kiel, 1994: 204-205; Walker, 2006: 102-103; Parker & Stacey, 1997: 34, 64).

A second emergent trend is that leaders should *encourage novelty* by allowing experiments and tolerate fluctuations in the organization (Lichtenstein et al, 2009: 622). The facilitation of interaction and particularly within a heterogeneous composition facilitates novelty and the emergence of sustainable collective action (Lichtenstein et al, 2009: 623-624; McKelvey, 2008: 3).

The latter argument is closely related to the third trend which states that leaders should *support bottom up processes* by allowing freedom of action on as low an aggregation level as possible (Baets, 2007: 108), developing a tolerance for uncertainty and risk-taking, and empowerment of the employees (Burns, 2002: 49-50; Kiel, 1994: 204-205).

One must also take into consideration that the dynamics of emergence requires the complexity oriented leader to find the balance between what structures and behaviour that provide *freedom and constraints* (Cilliers, 2010: 16).

The next step is to revisit some of the contextual reasons substantiating the claim of heterogeneity by degree as an essential meta-competency for leadership in complex military systems.

MILITARY CONTEXT

The meta-trend this dissertation aims to illustrate in the following paragraphs is a trend in which the context requires *adaptive capacity*, a capacity whose development is closely linked to the level of heterogeneity in organizations and individuals.

From a holistic perspective globalization, technological development and demographic trends in a context of interconnected and interdependent agents generate a high pace of change and great deal of uncertainty (O'Brien & Robertson, 2009: 371-373) which a high number of managers do not feel capable of addressing (IBM, 2010: 4)

The contemporary military operational environment is characterized by a wide spectre of operations ranging from "soft" humanitarian aid operations to the more "hard" conventional war operations in a multinational - and joint framework (Chan, 2006: 2). The present complex crises require an integration of military, social, economic, political and environmental approaches (McCausland, 2008: 89) to deal with non-state and state actors combining symmetric and asymmetric methods in a dynamic operational area of time and space (Strategic Trends Programme, 2010: 13; Schmitt, 1999: 104).

The discussion of the relevance of heterogeneity from a complex, leadership and military context may also be relevant for a link to an empirical setting. The next section briefly links heterogeneity to empirical research on the Norwegian Armed Forces thus illustrating the need for the development of adaptive skills.

EMPIRICAL EVALUATION

This section will accentuate some of the trends identified in chapter 6 and chapter 7 relating to the discussion of the Norwegian Armed Forces and heterogeneity.

First of all, on empirical research in this dissertation, Rønn (2009) and Billing and Nordang (2002) suggest that there is a major difference between the normative desire and descriptive reality, in which Norwegian Officers believe that principles related to heterogeneity are important. However, their *de facto* behaviour (descriptive) suggests otherwise.

Secondly, the Norwegian Armed Forces expel a strong homogenous trend both from an individual Officer perspective and as an institution. The high degree of formalization and standardization (Wong et al, 2003: 659), the similar patterns of thought and behaviour thoroughly discussed in chapter 7 and the distribution of demographic variables are all strong evidence of an organization with strong tendencies towards negative feedback mechanisms and an urge for equilibrium.

Thirdly, specific competencies of the Norwegian military officers and the Norwegian Armed Forces are identified as counterproductive for the creation of diversity. These are:

- The military culture in the investigated units of the Norwegian Armed Forces lack the key ingredients for developing adaptive properties (Nissestad, 2007: 228).
- The respondents score high on “uncertainty avoidance” (Nissestad, 2007: 226)
- The respondents score low on role-taking ability and openness (Nissestad, 2007: 254, 256).
- A significant number of the higher ranking officers in the Air Force lack essential competencies for a complex environment (Hellemsvik, 2002).

So far this chapter has presented and discussed the meta-competency heterogeneity of degree and has substantiated the relevance of this meta-competency in the literature of complexity, complexity and leadership, the context of military organizations and empirical research on the Norwegian Armed Forces. This dissertation will now continue by presenting the next meta-competency, androgynousity.

8.1.3 Meta-Competency Two – Androgynousity

Within the domain of leadership literature Sandra Bem (1975) was an early pioneer who suggested that individuals who possess both masculine and feminine traits are more likely to display adaptive behaviour. The assimilation of this duality of gender qualities may be referred to as being androgynous, for instance that one possess masculine qualities such as being persistent, rational, strong-willed and task oriented, in addition to feminine features

such as being non-competitive, compassionate, warm and relationship oriented (Schioldborg, 1997; Park, 1997, 166).

In the context of this dissertation being androgynous refers to a psychological perception, i.e. the combined presence of socially valued, stereotypic, feminine and masculine characteristics (Park, 1997: 167), not being androgynous in a biological and sexual sense something one could label hermaphroditism or bisexuality (Schioldborg, 1997).

Identifying what competencies might support leaders to develop androgynous qualities is primarily a discussion of *enabling capabilities*. Humility (Greenwood, 2007: 16), high role taking ability (Nissestad, 2007), trust (Ellingsen, 2007: 54), emotional intelligence (Nyhus, 2001: 18) and explicitly relationally oriented competencies such as tolerance, politeness, respect, empathy and compassion (Mæland, 2004: 250-258) are enabling capabilities for an androgynous leadership role.

Let us proceed with a presentation of the rationale behind identifying androgynousity as an essential meta-competency for leadership in complex military systems.

COMPLEXITY LITERATURE

A central characteristic of complex systems is that it is best described by relationships and interactions, not by the isolated elements and their properties (Wheatley, 1999: 34; Cilliers, 1998: 456; Blackman (2001: 440).

Deconstruction and determinism is thus of less relevance as the abstractions, stable and unstable, are an expression of the non-linear interactions between the elements, amongst the elements themselves and their local environment (Richardson, 2008: 15; De Villiers & Cilliers, 2004: 47).

In complex systems interactions and relationships are characterized as dynamic, fairly rich, non-linear and relatively short range which may create patterns of emerging complexity (Cilliers, 1998: 3-5). The non-linear aspect and emergent properties evidently necessitate a perception that the whole is more than the sum of its parts (Wheatley, 1999: 117-119; Cilliers, 1998: 456).

The theory of Complex Responsive Processes (CRP) describes how the process of human relating is a continuous and dynamic process in which the social constructions of group and

individual identities emerges through interaction (Stacey, Griffin and Shaw, 2000: 189-190; Aasen & Johannessen, 2009: 24)

The argument for androgynous capabilities should start to take shape now. Organic frameworks, as every complex system inherently is, require a shift of emphasis from absolute laws towards the narrative of process (Ulanowicz, 2008: 117). Complex systems are open and living systems (Cilliers, 1998: 4) which by definition makes them more "political" in a sense that mechanisms such as bargaining, negotiations and coalition building are natural elements in the emergent processes (Shamir & Ben-Ari: 2000: 53)

Simultaneously and owing to the number of soft tools and feminine oriented competencies that are substantive in the process of interaction, one must also acknowledge the potential "hard" aspects of emergent processes that might require more masculine oriented competencies. Emergence and self-organizational processes may lead to system failure and catastrophe (Morrison, 2010: 382) and human relating is equally influenced by power struggles, manipulation, uncertainty, anxiety and ambiguity, as creativity and innovation (Osberg, 2008: 221; Aasen & Johannessen, 2009: 24; Edvardsen, 2000: 269-270; Parker & Stacey, 1997: 64).

A balance between feminine and masculine competencies, an androgynous approximation, provides a broader foundation for leaders to adapt. In the next section we will turn the focus from system perspective to what arguments one might find for androgynousity in leadership literature.

COMPLEXITY AND LEADERSHIP LITERATURE

Leadership is in essence an intangible and subjective based process which is best described through the dynamics of emergence (Wheatley, 1999: 50-52; Lichtenstein & Plowman, 2009: 618).

From a complexity perspective leadership represents a complex form of social problem solving (Mumford et al, 2000: 14) in which the leader is an active participant (Walker, 2006: 108). An important focus of a complexity oriented leader is thus on the micro level interactions between people (Karp & Helgø, 2007: 35) and not on creating or controlling procedures and technical systems (Stacey & Griffin, 2005: 106, 116-117, 121-122).

Choosing a Complexity Approach to leadership is primarily based on the facilitation of bottom-up processes in which the empowerment of the human element is at the heart of success, not merely the top down mechanism of control (Simpson, 2006: 479; Martin, 2007:

6; Wheatley, 1999: 131). An important implication is the emphasis on informal conversational processes in an organization which provides individual and shared meaning, and physical and mental space in which opportunities rise (Taylor, 2005: 132-133, 148-149; Simpson & Gill, 2008: 48: Price, 2004: 45; Shaw, 2002)

The importance of interaction and focus on facilitation are arguments for the importance of soft management tools in a complex environment (Bondorowicz, 2010; Falconer, 2007: 137; Fairholm, 2003: 375-380). Emotional intelligence (Martin, 2007: 7; Nyhus, 2001: 18), inspiring, empowering, listening, understanding and coaching are considered crucial competencies for leaders in complex systems (Falconer, 2007: 137; Fairholm, 2003: 375-380).

Another soft oriented leadership mechanism is the importance of facilitating the emergence of vision and values as the core element of a system's reference signal (Stacey & Griffin, 2005: 7; Osborn & Hunt, 2007: 329, 332). Another label for the reference signal would be strange attractors which can be envisioned as "*a collection of variables that hold an inherently non-stable, non-linear system, such as an organization together and give it shape"* (Osborn & Hunt, 2007: 326).

Whereas indirect measures are an important trend in complexity oriented leadership, more direct approaches that require persistence and solution orientation are also a necessity. Samoilenko (2008: 43-44), for instance, shows how manipulation of interdependencies between components and communication channels may help manage organizational transformation and apparent chaos. Administrative leadership based on more traditional and hard organizational mechanism is also a necessary part of a Complexity Approach to leadership as it serves to benefit from the creativity and novelty, and the organization must integrate the emergent outcomes into the organization (Uhl-Bien & Marion, 2009: 633).

It is at the crossroads between a feminine and masculine approach that sustainable androgynous leadership emerges.

This dissertation will now continue with a discussion of some of the contextual factors that substantiate the need for androgynousity as an essential meta-competency for leadership in complex military systems.

MILITARY CONTEXT

The great speed of change and uncertainty caused by mega societal trends such as globalization, technological development and demographic trends propagates leaders who have a wide set of tools to address adaptive challenges.

Bondorowicz (2010) claims that the 21st Century setting calls for a wider integration of intangible, soft skills, a claim which is supported by surveys managed by Center for Creative Leadership (CCL) (Martin, 2007: 6) and the Conference Board (2006).

The contextual discussion in the latter meta-competency of heterogeneity of degree highlighted the wide range of operations and the integration of military, social, economic, political and environmental approaches in order to deal with contemporary challenges. Apart from these highly relevant factors this dissertation will shortly examine Revolution in Military Affairs (RMA) and Network Centric Warfare (NCW) as particularly relevant to the meta-competency of androgynousity.

Revolution in Military Affairs (RMA) or Information Revolution in Military Affairs (I-RMA) refers to the belief that complicated technology is the driving force behind change and the panacea for military challenges. RMA is highly relevant to the discussion of androgynousity due to the fact that there is more and more empirical evidence, for instance the Israel – Lebanon war in 2006 (Daltveit et al, 2010: 21), challenging the Western paradigm that technology – as opposed to concepts and ideas deriving from human beings - is a sustainable driver of change (Febrarro et al, 2008: 9-5).

The second factor of NCW is based on the belief that one can achieve more through collaboration in networks. Research conducted by Sagen (2008) in the Norwegian Defense Force concerning Network Centric Warfare and the human factor states that *trust* and *relationships* between decision makers on various levels in the organization must be strong in order to achieve flexibility (Sagen, 2008: 58-59; Kristiansen, 2003: 21; Febrarro et al, 2008: 9-4). Technology might provide a helpful tool in terms of information sharing, but a network centric approach, which implies that processes go across traditional boundaries as for instance hierarchical levels, needs to emphasize social processes in order to achieve success (Sagen, 2008: 58-60; Lundstein, 2009: 62).

The complexity of the wider military context exposes military leaders to potentially contradictory role expectations which also change rapidly (Shamir & Ben-Ari, 2000: 53),

something which illustrates the importance of possessing a high *role taking ability* and other *enabling capabilities* for the development of a sustainable androgynous leadership approach.

EMPIRICAL EVALUATION

Based on the empirical research discussed in chapter 6 and chapter 7, this dissertation will argue that in terms of possessing androgynous qualities, the Norwegian military officers and the Norwegian Armed Forces are scoring relatively high on masculinity and relatively lower on femininity, thus indicating a general trend of relatively low androgynous qualities.

This identified trend may be exemplified through a short selection of empirical findings on the Norwegian Armed Forces:

- In term of culture, research by Totland (2009), Lundstein (2009: 61) and Haaland (2008:170) illustrates masculinity as a central value.
- The demographic composition reveals a great majority of men (which not necessarily excludes the possibility of a high level of androgyny).
- Research by Soeters and Recht (1998) suggests that Norwegian Military Cadets score high on masculinity, meaning "*the importance attached to income growth and possibilities of promotion, in comparison with job security and good working relations"* (Soeters & Recht, 1998: 173)
- There are few effective institutional mechanisms promoting the general welfare of women in a long term perspective (Kristiansen, Boe & Skjæret, 2010: 3; Brundtland et al, 2009:3; Aambakk, 2007: 80; Hovde, 2010).
- Research by Hansen and Larsen (2006) reveal a relatively low score on agreeableness, i.e. the domain of inter-human relations such as communication, trust and morale. Lundstein (2009: 55-56) further concludes that the Norwegian female officers score considerably higher on the factors of "warm, "emotions" and "openness", whereas the male officers score higher on the factor of "control".
- Findings from Nissestad (2007: 254, 257) indicate a lack of role-taking ability and low score on openness.
- The empirical survey of this dissertation and Rønn (2009) reveal that a strong majority of the respondents describe their leadership style using metaphors related to a "traditional", "hard" and "masculine" approximation and consequently a marked minority uses "complexity", "soft" and "feminine" images to illustrate their leadership style.

In the presentation of meta-competencies for leadership in complex military systems this dissertation has so far presented and argued for the relevance of heterogeneity by degree and androgynousity. The next step is to present the meta-competency of cognitive flexibility.

8.1.4 Meta-Competency Three – Cognitive Flexibility

According to Chieu and Herbst (2008: 1) cognitive flexibility may be defined as *"the ability of human subjects to structure or restructure their own knowledge, in many ways, in order to respond to a variety of situational demands".* Rich domains and irregular patterns is a natural part of complex systems in which cognitive flexibility may acts as a facilitator for deep knowledge in conceptually challenging contexts (Spiro et al, 1991: 28).

From this it follows that a high degree of cognitive flexibility is closely linked to a high degree of general cognitive capacity (Warner & Trant, 2007: 259), which is an essential key in increasing the resources of a system (Sturmberg & Cilliers, 2009: 883).

The observant reader will by now hopefully have proved their own high cognitive capacity by identifying the symbiotic relationship between the previously discussed meta-competencies of heterogeneity by degree, androgynousity and cognitive flexibility[36].

Increasing the cognitive flexibility of leaders is therefore integrally related to the competencies described in the latter meta-competencies in addition to the capabilities listed below:

- *Creativity* – which may be interpreted as the ability to incorporate many perspectives and create novel solutions to challenges (O'Brien & Robertson, 2009: 374-376; IBM, 2010: 3).
- *Mental agility* – which might be understood as flexibility of mind and adaptability in situations of uncertainty or change (Kit, 2008: 3; O'Brien & Robertson, 2009: 374-376)
- *Strength of mind* and *mental readiness* – which may be described as acceptance and persistence in an asymmetric and uncertain context (Williams, 2003: 21, 25, 26-27)

[36]A matter which will be further discussed in the second section of this chapter

- *Pattern recognition* – which may be interpreted as the ability to retain/envision a holistic perspective and identifying macro developmental patterns (Boyatzis, 2008: 7; Jokinen, 2005: 208)
- *Abstract reasoning* which develops the capabilities of thinking non-linearly and "out of the box".
- *Intellect* defined as *"the ability to learn and reason; the capacity for knowledge and understanding"* (The Free Dictionary (1); Williams, 2003: 28).

The literature on complexity provides many examples of the need for cognitive flexibility among leaders, something discussed in more detail in the next section of the dissertation.

COMPLEXITY LITERATURE

Complex systems are open, non-linear and organic systems (Cilliers, 1998: 4), which are highly sensitive to initial conditions (Parker & Stacey, 1997: 13).The agents (abstract and concrete) of a complex system are inherently interdependent and co-create the presence through interaction.

Knowledge, for example, historically interpreted as a linear structure, is presently portrayed as a dynamic and emergent networked property developed through our transaction with the environment (Klein, 2004: 3; Osberg et al, 2008: 224), something which tells us that knowledge is always provisional (Cilliers, 2005: 260) and an unending process (Osberg et al, 2008: 224).

One implication of co-creation, emergence and non-linearity is that everything is to a certain degree entailed by fundamental uncertainty which states that in principle every moment is a moment of surprise (Stanley, 2009: 49).

At the heart of complexity thinking lie the assumptions that there are limitations and an inherent vagueness in terms of what we can know for certain (Richardson, 2008: 13). We cannot with any clarity know what impact is left out of the equation and what impact this omitted element will have on the outcome (Cilliers, 2005: 260).

The next section aims to discuss the meta-competency of cognitive flexibility from a complexity leadership perspective.

COMPLEXITY AND LEADERSHIP LITERATURE

The fundamental uncertainty related to emergent processes suggests that leadership actions tend to be *novel* and not based on routines. The intricate life of complex systems such as social organizations in many cases makes it less comprehensive to work in a purely systematic and analytical way, whereas leaders often must take *ad hoc* decisions on rapidly unfolding and perhaps ill-defined challenges (Mumford et al, 2000: 14).

It is of particular relevance to link the need of cognitive flexibility to the notion of adaptive leadership. Adaptive leadership refers to *"adaptive, creative and learning actions that emerge from the interactions of CAS* [complex adaptive systems] *as they strive to adjust to tension"* (Uhl-Bien, Russ & McKelvey: 2007: 305-308).

As earlier noted, complexity oriented leadership is largely about focusing *on micro-level interactions* and the use of *soft management tools.* The process of interaction between human beings is to a great extent a dynamic, open and "living" process full of paradoxes that require a great level of cognitive flexibility in order to interpret and act upon.

The context of most military organizations is also, this dissertation argues, an argument for the need of cognitive flexibility. This is something the next section will discuss in more depth.

MILITARY CONTEXT

Cited in Bondorowicz (2010), Donald Rumsfeld (2002) provides a general description of the contemporary context of military organizations:

- *"There are known knowns – things we know that we know*
- *There are known unknowns – things we know that we don't know*
- *There unknown unknowns – things we don't know we don't know*
- *There are unknown knowns – things we don't know but think we do"*

The complexity of the context is further increased by the fact that public sector organizations often have strong political and judicial constraints (Schwella, 2001: 14), stronger demand for transparency and accountability and a qualitative orientation (Thach & Thompson, 2007: 357: Ketel, 2005: 56).

From a traditional Newtonian view war can be interpreted as the "*collision between two billiard-balls* "(Ilachinski, 1996: 46), whereas a complexity perception speaks for a view of war as "*an organic exchange of energy, matter and information"* (Schmitt, 1999: 104). War, as an open and emergent system, is thus a pattern based on a myriad of political, economic, socio-cultural and environmental factors interacting, where asymmetry and adaptive challenges are more the rule than the exception.

Differentiating between a military aspect and other aspects, for instance a socio-cultural aspect, is becoming more and more difficult in an interconnected reality (Shamir & Ben-Ari, 2000: 53). Given the endless complexities of war it is difficult exercise to produce optimal solutions to both asymmetric and symmetrical challenges (William, 2003: 21-22), which speaks for leaders who are comfortable with uncertainty and have the ability to quickly adapt to whatever situation emerges and identify and seize opportunities" (Daltveit et al, 2010:18).

Let us now revisit some of the empirical findings in the context of this proposed meta-competency.

EMPIRICAL EVALUATION

The following section will highlight three trends that one might argue inhibit the development of cognitive flexibility among Norwegian military officers and generally for the Norwegian Armed Forces.

First of all, discussions in chapter 6, chapter 7 and meta-competency one suggest that one of the meta-trends among the officers and the Armed Forces is the notion of homogeneity; something this dissertation will argue encourages bureaucratic traditions of optimizing, standardization and formalization, and not development of cognitive flexibility and other adaptive skills.

Secondly, the empirical research in this dissertation on a selection of Norwegian military officers[37] identifies more specific trends that support the statement above, more accurately:

- Trend 1: A Complexity perception of conflict, chaos and disruption are perceived to be dysfunctional
- Trend 2: The Officers are highly goal-oriented

[37] In addition to empirical research from Rønn (2009).

- Trend 3: The Officers believe that rational mechanisms such as long term planning and prediction are crucial to achieve success
- Trend 4: The Officers believe in leadership dependence, a person-oriented leadership and (a traditional) "hard" leadership style

Third and finally, the educational and training paradigms of the Norwegian Armed Forces tend to be unsynchronized with the *de facto* context and needs, as illustrated by Nissestad (2007), Sandnes (2007), Gussiås (2009) and Trettenes (2009: 76-77) in chapter 7 of this dissertation.

The implicit uncertainty related to non-linear systems evidently makes the domain of *choice* a highly relevant topic for leaders. The next meta-competency which will be investigated is *ethical reasoning*.

8.1.5 Meta-Competency Four – Ethical Reasoning

Ethics may be interpreted from many perspectives. From an individual point of view it may be referred to as the moral principles manifested in the individual's action. One might also connect ethics to specific segments such as ideology or religion. For instance Christian ethics, or professional ethics, such as medical ethics and public sector ethics, with reference to a particular set of moral principles relevant for that isolated segment. Ethics may also be linked to a particular branch of philosophy *"dealing with values relating to human conduct, with respect to the rightness and wrongness of certain actions and to the goodness and badness of the motives and ends of such actions"* (Dictionary.com (1)).

Ethics is a dynamic and contextually driven process (Cilliers, 2004: 19) where an individual or institution's capacity of ethical competence must be interpreted from a life-long-learning perspective, not as specific skills one can learn in short term courses (Mæland, 2003: 20).

Ethical actions are thus not something one must interpret as isolated from other activities (Cilliers, 2004: 25) as ethical concepts are developed and manifested through human relating (Cilliers, 2004: 19). Ethical consciousness must be regarded as essential because an individual is constituted by its ethical behaviour. Cilliers (2004: 25) provides the following example to illustrate this point:

"One is not a thief because stealing is prohibited by a law, or when you are caught out. One becomes a thief through stealing, whether someone else knows or not. You are constituted

as a thief by stealing just as you are constituted as a person of integrity by what you do, irrespective of the recognition you get".

The meta-competencies of heterogeneity of degree and androgynousity, alongside the meta-competencies of cross-cultural learner and identity (the latter which has not yet been presented), are valuable capabilities in order to facilitate the development of ethical capacity through a fundamental focus on *interaction*, *pluralism* and *broad spectrum experience*.

Whitton (2007: 52-53) argues that there are certain skills that will promote ethical competence:

- *Subject-matter knowledge* about institutional ethical standards
- *Reasoning skills* in order to identify ethically challenging situations
- *Problem solving skills* to resolve ethical problems
- *Advocacy skills* to effectively promote a principled view of the matter and how to solve it
- *Self-awareness and consensus-building skills* in order to identify own ethical positions, individual and institutional, and build consensus among the different approaches
- *Attitude and commitment* as a natural step to enable the development ethical competence

Whitton (2009: 7) further states that there are certain ethical values among public officials. They are referenced briefly below:

Integrity, service, transparency, confidentiality, honesty, accountability, service to others, fairness, impartiality, respecting the law, reliability, efficiency, flexibility, effectiveness and responsiveness to Government.

The inherent vagueness of complex phenomena and the boundaries and limitations to our knowledge provided by the non-linear and emergent processes, evidently makes ethics a highly relevant subject for leadership in complex military systems. Let us elucidate this claim in the following section.

COMPLEXITY LITERATURE

An essential implication of emergence is the revival of *free will* but simultaneously a reintroduced credibility of *personal responsibility* (Ulanowicz, 2009: 152) to develop knowledge, interest and respect for the *unknown* (Mæland, 2003: 20).

The cognitive limitations of the human brain essentially make it impossible to capture the complexity of a system (Osberg et al, 2008: 224; Richardson, 2008: 24) making generalization of complex phenomena impossible (Cilliers, 2004: 20-21). Human beings must, however, make choices of simplifying the complexity in order to make it meaningful, but it eventually turn the moment of choice into a moment of *ethical choice* as we cannot escape the reality of how that choice will be manifested in the complex reality (Cilliers, 2004: 23-24).

In an interconnected reality we cannot therefore escape the moment of choice (Richardson, 2008: 22; Heylighen & Cilliers, 2006: 16; Cilliers, 2004: 20-21) and everything we do is thus linked to normative considerations and ethical implications (Cilliers, 2005: 259).

From a complexity point of view it is therefore a legitimate action to challenge rule based ethics. One might ask the critical question whether a rule, which from a normative viewpoint should represent the behaviour of the system, is a relevant representation as the output of the system is partially determined by a set of rules of which we do not have any knowledge (Osberg, 2008: 220). Following a rule does not necessarily constitute an instance of ethical behaviour. This is because the response might simply be a pure rational calculation of what behaviour is appropriate (Cilliers, 2004: 20), and not necessarily an "active" moral decision *per se*. Ethics must thus be perceived to be an active and dynamic process with *unfolds* (Stengers, 2004: 96) and as a provisional tool (Cilliers, 2004: 24).

Ethics is a suitable example of strange attractors (which were discussed under the meta-competency of androgynousity) which may be interpreted as multiple and dynamic mobilization points for change (Dilworth, 1998: 497; Parker & Stacey, 1997: 97; Wheatley, 1999: 132) or "*a collection of variables that hold an inherently non-stable, non-linear system, such as an organization, together and give it shape"* (Osborn & Hunt, 2007: 326).

Let us turn the discussion to the field of leadership.

COMPLEXITY AND LEADERSHIP LITERATURE

The notion that every moment of choice has a normative and ethical dimension has implications for every aspect of leadership.

When leaders adopt a specific *modus operandi* they simultaneously make a choice selecting a particular view of how the world in which we participate is constructed, and how they anticipate it should respond to our actions (Richardson, 2008: 22-23). Specific conditions of what is ethical behaviour, for instance integrity and "telling the truth", may as earlier

suggested, have less relevance in complex and multifaceted environments as opposed to simpler operational contexts (Cook, 1999: 1-2).

Mæland (2002: 34) further states that with increased responsibility of leadership considerations, attitudes and cognitive flexibility, it is necessary to put much emphasis on the moral- and ethical competencies of leadership.

MILITARY CONTEXT

Research from Bird (1996) and Bird and Waters (1999) reveal that the majority of leaders choose to ignore or be low-voiced about morality. Leaders are frightened by the idea that preaching morality may lead to confrontation and disharmony, lower productivity and disrupt the idea that a leader has control and power.

Military ethics may be seen as a set of ethical precepts relevant to the professions of arms (Foster et al, 2010).

It might be worthwhile spending a moment reflecting on the difference between law and ethics. On the one hand military operations are regulated through two main principles of law, *jus ad bellum*, rules and regulations related to the question: when is it legitimate to wage war and *jus in bellum*, the rules and regulations concerning the method of war (Syse, 2003: 68). On the other hand, military ethics appeals to intangible aspects such as consciousness, sense of honor and feeling of solidarity, with less or no formal methods of sanction (Mæland, 2002: 32).

Let us put forward some of the arguments as to why ethical reasoning is a particularly important meta-competency for leadership in complex military systems:

First of all, the general context of military organizations is highly complex with a myriad of political, socio cultural, economic, technological and environmental factors co-creating a milieu of uncertainty thus making ethical decision a difficult exercise (Kit, 2008: 9).

Secondly, the extreme nature of war or war-like military operations raises a number of ethical questions, and characteristics such as group conformity, claim loss of personal responsibility in an authoritarian system and moral disconnection (Rojas-Munoz & Frésard, 2004: 8, 9, 11) make a strong ethical foundation an important strange attractor for the system "*hold*[ing] *an inherently non-stable, non-linear system, such as an organization, together and give[*ing*] it shape"* (Osborn & Hunt, 2007: 326).

Thirdly, due to advances in technology the decision maker (whether it is the private or the General) is not necessarily emotionally attached to the effect caused by the decisions. By implication this means that the individuals' intuition or "gut feeling", which is highly central in ethical considerations, no longer has the relevance it would have had if the decision maker was "on-site" (Roer, 2008: 30).

Let us briefly consider the empirical research.

EMPIRICAL EVALUATION

The empirical research considered in this dissertation does not create the proper basis from which to evaluate the relationship of the subject of the research to the meta-competency of ethical reasoning.

This dissertation does, however, want to refer briefly to a study conducted by Sondov (2010) at the Norwegian Joint Staff College which investigates the military ethics in the context of the Norwegian military participation in Afghanistan. Of particular interest to this discussion are the following conclusions:

- Ethical considerations and independent decision making is necessary because it is not always ethically responsible to use the defined operational space.
- Ethics should be more integrated into preparations that precede deployment into international operations.
- The ethically challenging nature of mixing the non-uniformed combatant population of the Taliban with the non-combatant part of the population.
- The respondents in this study emphasize that a well-developed judgment is one of the pillars in the military professional identity, and is consequently always instrumental in the decision making process.

The nature of participants in contemporary military operations is diverse and the incorporation of non-military institutions in military operations is becoming increasingly evident. This dissertation suggests that military leaders are in need of high cross cultural competence in order to adapt to the complexity environment.

8.1.6 Meta-Competency Five – Cross Cultural Competence

Culture is a multifaceted term which may be linked to a number of things, for instance *"the behaviours and beliefs characteristic of a particular social, ethnic, or age group"* (Dictionary.com (2)).

Selmeski (2007: 4) however argues that culture should *not* be understood in terms of activities, articulated statements, social groups or material objects, but instead be perceived to be a subjective and abstract process in which individuals participate in the co-evolutionary project of making a culture (Ellingsen, 2008: 35; Ng et al, 2005: 9; Selmeski, 2007: 4). Culture, as interpreted in the context of this dissertation, is thus about human creation, the use of tools and symbols, and the sense of fellowship which distinguish human beings from the animals and pure nature (Ellingsen, 2008: 35).

Cross cultural competence may be referred to as *"the ability to quickly and accurately comprehend, then appropriately and effectively engage individuals from distinct cultural backgrounds in order to achieve the desired effects. Despite not having an in-depth knowledge of the other culture and even though fundamental aspects of the other cultures may contradict one's own taken-for-granted assumptions/deeply-held beliefs"* (Selmeski, 2007: 12)

Defining cross-cultural-competence is thus more about describing the *enabling* capabilities of human cognition than propagating specific steps or rules to address challenges of a cross-cultural setting.

A cross-cultural experience does not necessarily imply an interaction with something "exotic" or in time or space, a distant situation from your everyday life. Developing cross cultural competence is equally important in understanding and engaging in "close" cultures such as with colleagues at the workplace and different branches of your organization, as it is for adaptive challenges in a more multifaceted and distant context (Selmeski, 2007: 13-14).

In developing cross cultural competence it is helpful to distinguish between two separate, but complimentary, approaches.

The first approach may be characterized as *enabling* capabilities which are underlying competencies of human cognition that help to develop sustainable cross cultural competence

(lifelong perspective and acontextual) and the successful acquisition of specific cross cultural competencies (short term and contextual) (Ng et al, 2005: 2; Selmeski, 2007: 7).

Earley and Ang (2003) use cultural intelligence, i.e. "*an individual's capability to adapt effectively to new cultural contexts*" (Selmeski, 2007: 8) or "*an individual's capability to deal effectively with people from different cultural background and understandings"* (Ng et al, 2005: 5), as a starting point and suggest four fundamental competencies:

- *Meta-cognitive cultural intelligence*, which may be referred to as individual mental processes that support the acquisition and understanding of cultural knowledge;
- *Cognitive cultural intelligence*, which constitutes general knowledge and knowledge structures about culture as a phenomenon;
- *Motivational cultural intelligence* understood as an individual's intrinsic drive to learn about and function in multifaceted cultural situations; and,
- *Behavioural cultural intelligence* in terms of exhibiting adequate non-verbal and verbal actions in the process of interaction.

The second approach, which is enabled by the first, focuses on specific skills and behavioural aspects. Yamazaki and Kayes (2004) sited in Ng et al (2005: 4) suggest nine broad cross cultural competencies. These are:

"Building relationships, valuing people of different cultures, listening and observation, coping with ambiguity, translating complex information, taking action and initiative, managing others, adaptability/flexibility and managing stress".

Yet again this dissertation must re-emphasize the interconnected and mutual dependent relationship between the meta-competencies. Every meta-competency which has been presented thus far, and the meta-competencies yet to be discussed, are in symbiotic and synergetic association with cross cultural competence and enable a *condition* in which continuous adaptation is possible.

Let us briefly discuss how the meta-competency of cross cultural competence is relevant in complexity literature.

COMPLEXITY LITERATURE

A nexus of interrelated and co-evolutionary agents of concrete and abstract propensities create a picture of *reality* in any context or domain; biological, physical, social, psychological or chemical (Klein, 2004: 4, Heylighen & Cilliers, 2006: 12).

From this it follows that an interaction or pattern of intangible and abstract origin, for instance a single mental thought or a pattern manifested as your mental state, may alter physical change (Ulanowicz, 2008).

Culture, as with the former meta-competency of ethical reasoning, is a suitable example of the latter point expressed as a *strange attractor* of a complex system, where the myriad of connections understood as culture act as the boundary of a system that enable it to operate in *"the domain between linearly determined order and indeterminate chaos"* (Waldrop, 1992).

Culture must thus *not* be understood as something exotic and marginal, but as fundamental and central to every aspect of human relating (Pedersen, 2002: 5).

In the paragraphs that follow I will integrate the meta-competency of cross cultural competence to the domain of complexity and leadership.

COMPLEXITY AND LEADERSHIP LITERATURE

It is suggested that in order to develop sustainable cross cultural competence one needs to possess m*eta-cognitive cultural intelligence*, c*ognitive cultural intelligence*, *motivational cultural intelligence* and *behavioral cultural intelligence* (Earley & Ang, 2003).

Cross cultural competence is thus embedded in the cognitive processes manifested in every interaction of a human being, either expressed in "internal" and abstract processes or "external" and physical acts.

Based on this it is reasonable to state that cross cultural competence is highly relevant for all the leadership propositions of chapter 4, as it is difficult to imagine successful implementation of (for instance) sense-making (proposition 3.3), indirect leadership (proposition 3.4) and support of bottom-up processes (proposition 3.5)[38], all propositions fundamentally being challenges of adaptive character, without the ability to "*quickly and accurately comprehend, then appropriately and effectively engage individuals from distinct cultural backgrounds to achieve the desired effects* (Selmeski, 2007: 12).

The argument for the relevance of the meta-competency of cross cultural competence must also be discussed in the context in which complex military systems operate. This will be done in the next section.

[38]To name only a few of them

MILITARY CONTEXT

One effect of globalization and rapid technological development is not only that we are interconnected and to a large extent interdependent, but it also implies that the *diversity* of the agents we are interacting with is far greater than in the pre-globalization era.

This trend is also applicable to the development of military operations as the last decades have increased the scope of military operations to incorporate peace support operations, disaster relief and humanitarian assistance in a global setting (Ng et al, 2005: 1).

Military forces must be equipped to deploy rapidly and to be ready to cope with operations across the full spectrum of conflict (NATO, 2010: 2). Success in current and future conflict is less dependent on *kinetics,* but requires strong *influence* activity implying greater insight into the enemy *modus operandi* and seamlessly interoperability with other military forces, civil authorities, non-governmental organizations and other agencies (Strategic Trends Programme, 2010: 17; NATO, 2010: 2).

This complex setting demands a great set of competencies and leadership skills than in a more conventional military context, of which the ability to overcome cultural barriers, integration of heterogeneous teams and stimulation of mutual respect and trust among diverse partners, are essential (Febbraro et al, 2008: 9-2; Strategic Trends Programme, 2010: 17; Ng et al, 2005: 1).

We will continue our examination of cross cultural competence in the empirical setting of the Norwegian military officers and Norwegian Armed Forces.

EMPIRICAL EVALUATION

A research report from the Norwegian Institute of International Affairs (NUPI) by Trine Holo and Morten Dehli Andreassen (2010) investigates the Norwegian Defense Forces' perception and management of cultural understanding in an international operations' context and concludes that while adequate cultural understanding is essential for the military units in an international setting, the development of this understanding has little emphasis in pre-deployment training.

This dissertation will also briefly revisit the empirical evaluations of meta-competency 1, 2 and 3 further shedding light on the empirical setting in the context of this meta-competency.

In meta-competency one, heterogeneity, this dissertation argues for a strong homogenous trend and specific detrimental competencies for the development of individual and institutional diversity, something, one can argue, is negative for the *enabling* competencies of cross cultural competence.

The discussion of the empirical setting in meta-competency two, androgynousity, argues for a trend of relatively low androgynous qualities which is unfavourable for the development of cross cultural competence, bearing in mind the high importance of soft skills.

Meta-competency three, cognitive flexibility, further highlights inadequate training, an educational system slow to adapt to the current operational needs and specific individual trends of perception, disfavouring cognitive flexibility. It is reasonable to assume that the level of cognitive flexibility is somewhat linked to the level of cross cultural competence due to the central position of adaptive capacity in cultural intelligence which may be defined as "*an individual's capability to adapt effectively to new cultural contexts*" (Selmeski, 2007: 8).

The series of never-ending variables that affect a situation and particularly at the speed of change we experience often makes rational- and monist analytical approaches inadequate tools. Let us turn the discussion over to meta-competency six, intuition.

8.1.7 Meta-Competency Six – Intuition

Intuition may be defined in a number of ways, some of which are:

- "*The act or faculty of knowing or sensing without the use of rational processes"* (Thefreedictionary.com (2)),
- *"The capacity to sense messages from our internal store of emotional memory – our own reservoir of wisdom of judgement"* (Downey, Papageorgiou & Stough, 2006: 252) or,
- *"The ability to tap into our natural knowing capacity (e.g. internal sources and tacit knowledge) to obtain knowledge without a logical explanation* (O'Brien & Robertson, 2009: 374-376).

The study of intuition is thus something one would relate to human thoughts and emotions (Nyhus, 2001: 10) and a methodology not dependent upon carefully generated or assessed data (William, 2003: 29

Intuition, being a complex cognitive function, requires *experience* for it to be developed (McCaffrey (2007: 11), something which speaks for the particular relevance of individual heterogeneity (meta-competency one).

Several authors also assert the link between *emotional intelligence* and the development of intuition (see Downey et al, 2006: 251) requiring androgynous capabilities (meta-competency two). O'Brien and Robertson (2009: 374-376) further claim that intuition requires an ability to suspend *judgment* and possess high levels of *somatic sensitivity*, which is a natural means to link cognitive flexibility and cross cultural competence (meta-competency three and five).

Evidently, the development and use of intuition is connected to some kind of *risk taking* (due to the uncertainty) and necessitates *trust* towards intangible and abstract processes that one cannot fully comprehend.

Complexity literature offers some explanations for the relevance of intuition, something which now will be elaborated upon.

COMPLEXITY LITERATURE

Being rational implies acting logical, maximizing benefits and taking decisions based on a thorough analysis of all alternatives (Bondorowicz, 2010).

Such an approach means that one reduces the complexity of phenomenon into the knowledge of the properties of each simple component of the system, something one might refer to as reductionism (Mitchell, 2004: 82-93; Heylighen & Cilliers, 2006: 2). There is also an *atomistic* aspect of reductionism which maintains that one can build up a system by merely summarizing its isolated parts (Cilliers, 1998: 456). In this "paradigm of order " (Geyer, 2003: 3) the world is best perceived as an isolated, unchallengeable and static object operating in a deterministic framework (Juarrero, 2007: 110).

From a complexity point of view, however, the world is perceived to be open, dynamic and based on emergent processes, which necessitates a *qualitatively* oriented approximation (Parker & Stacey, 1997: 18-19). Working analytically and systematically in intricate complex systems is thus often difficult, and sometimes counterproductive, when the rapidly unfolding processes require capabilities of *synthesis* and *ad hoc decisions* (Mumford et al, 2000: 14).

Because it is impossible to follow the causal linkages in the myriad of interacting biological, physical, social, psychological and chemical agents one is left to talk about *probabilities* and *patterns* emerging over time. Intuition may be thought of as just such a pattern.

One can say that the intuition becomes a reflection of all the complex processes in the individual and his/ her interactions.

The next section will briefly link intuition to complexity and leadership.

COMPLEXITY AND LEADERSHIP LITERATURE

Downey et al (2006: 252) state that in times of uncertainty and change, it has become imperative to incorporate intuition in the decision making processes. An empirical study by Andersen (2002: 61) further substantiates this claim by suggesting that the use of intuition as the dominant decision making function is related to organizational effectiveness.

In line with the meta-competencies of ethical reasoning and cross-cultural-competence, intuition is embedded in all the cognitive processes of an individual, and thus has relevance to all aspects of leadership.

For instance, leading through the use of simple rules (proposition 3.2) in times of rapid change presupposes the ability to intuitively know what is most likely to catalyze the system. In all propositions that imply human relating (e.g. proposition 3.5[39] and 3.10[40]) intuition plays a crucial role in spontaneous interpretation of signals and acting on these signals.

One could also link the importance of intuition to adaptive leadership, which is understood as *"adaptive, creative and learning actions that emerge from the interactions of CAS* [complex adaptive systems] *as they strive to adjust to tension"* (Uhl-Bien, Russ and McKelvey: 2007: 305-308). The ability to respond quickly and appropriately to adaptive challenges is difficult, or impossible, without a well-developed intuition.

The military context also provides good arguments for the relevance of intuition as a central meta-competency, something the next section will present.

[39]complex leaders support bottom up processes
[40]complex leadership mainly focus on micro-level interactions between people

MILITARY CONTEXT

The perception of war as "*an organic exchange of energy, matter and information"* (Schmitt, 1999: 104) and the unfamiliar, intricate and rapidly changing environment of military operations makes intuitive decisions highly relevant for military leaders (McCaffrey, 2007: 1-2).

Although the contemporary military environment speaks for a high degree of intuitive thinking and decision-making, the importance of *intuition* among leaders is also a clear pattern in military history.

Military theorist and Prussian officer Carl Van Clausewitz states that *"action can never be based on anything firmer than instinct, a sensing of the truth"* (Williams, 2003: 28).

In an analysis of thinking styles of historical military commanders Graco (2010) suggests that, in a setting of fluid warfare, which is innately unpredictable, confusing and chaotic, the ability to take the initiative and to improvise solutions is the key element to achieve success. This argument evidently makes intuitive decision making highly relevant. A similar study by Thobiassen (2001) which investigates the properties of historically great military leaders also suggests intuition as an essential competency.

We will continue our examination of intuition as a meta-competency in the empirical setting of the Norwegian military officers and Norwegian Armed Forces.

EMPIRICAL EVALUATION

The discussion of empirical data in chapter 6 and chapter 7 of this dissertation identifies some institutional and individual trends that might inhibit the development and reliance on intuition.

Because military organizations may be thought of in general terms as public organizations, they are subject to strong political and judicial constraints (Schwella, 2001: 14) and simultaneously to demands of accountability and transparency. Hierarchical and formalized organizations, as often is the case with military organizations (Soeters & Recht, 1998: 171; Kirkhaug, 2008: 22-24), often have clear behavioural expectations on individuals and structural procedures as a working method (Wong et al, 2003: 659).

Intuition, which characteristically is non-quantifiable, abstract and organic, may be perceived to be less relevant and perhaps too risky to use in an organization nurturing rational processes.

There are also indications in the empirical data that the Norwegian military officers tend towards utilizing more rational mechanisms than intuitive ones. On a specific question on the relationship between rational and intuitive decision making (factor 15) in the empirical survey of this dissertation, a *moderate majority* of the respondents support a rational approximation. This specific question in conjunction with a number of other questions reveals a trend in which the officers believe in the high importance of rational mechanisms in order to achieve success (trend 3).

The institutional and individual competencies discussed above, and the empirical discussions on the meta-competencies of heterogeneity by degree and androgynousity revealing a strong homogenous trend, and the relatively high reliance on masculine qualities, constructs the ground for stating that there are several factors with regards to the research subject that inhibit the development and adequate use of intuition as an essential adaptive tool.

The asymmetric challenges of contemporary military operations necessitate the ability for constant individual and institutional transformation. This will be addressed in the next meta-competency of identity.

8.1.8 Meta-Competency Seven – Identity

The first step in describing identity is to start with the ability of self-awareness.

Self-awareness may be referred to as *"the ability to assess abilities, determine strengths in the environment, and learn how to sustain strengths and correct weaknesses"* (Wong et al, 2003: 2-3). Jokinen (2005: 205) describes a more intrinsic approximation which refers to self-awareness more in terms of *"deep understanding of his/her emotions, strengths and weaknesses, needs and drives, sources of frustration and reactions to problems".*

The meta-competency of identity goes past merely assessing one's strengths and weaknesses (Wong et al, 2003: 5) as a representation of *status quo*, incorporating also the notion of adaptability.

A definition of identity can be presented as *"the ability to gather self-related feedback, to form an accurate self-perception, and to change one's self-concept as appropriate"* (Briscoe & Hall, 1999: 49).

Adaptability and identity are symbiotic and synergetic in the sense that each process as a stand-alone concept might achieve less than the outcome of the two processes cooperating. One the one side, changes in identity without the adaptive aspect could be close to self-aware inaction, and on the other hand adaptability without identity could end up as mindless reaction to the environment. The integration of both processes enables *meta-learning*, which may be defined as learning how to learn (Briscoe & Hall, 1999: 49).

Identity is equally as much a question of who 'they are' in a broader framework, not merely an assessment of how well 'they' do things (Wong et al, 2003: 6). The broader perspective includes an understanding of own values, the values of the organization and awareness of the internalization of these values (Briscoe & Hall, 1999: 49; Wong et al. 2003: 2-3).

Identity is a dynamic and emergent property which it is natural to relate to lifelong learning. Lifelong learning is in itself a resource for self-renewing, an enabler of autopoiesis (Schwartzman, 2003: 64).

The literature suggests some competencies that might aid for identity learning:

- Engage in personal transformation (Jokinen, 2005: 205; Briscoe & Hall, 1999: 49) and actively seek out self-assessment processes (Williams, 2003: 27: Briscoe & Hall, 1999: 49).
- Be open to new experiences and value diversity in both people and ideas (Briscoe & Hall, 1999: 49; Jokinen, 2005: 205). This may be referred to as heterogeneity.
- Be critical towards one's own assumptions (Jokinen, 2005: 205) and exercise authenticity in terms of being committed to the truth of who you are (O'Brien & Robertson, 2009: 373).

The next section interprets the meta-competency of identity in the framework of complexity literature.

COMPLEXITY LITERATURE

A complex system has self-generating capabilities in the sense that there are a number of fundamental processes that enable a recurrent flow of energy to the system allowing it to create and renew itself. This is what can be labelled as *autopoiesis* (Wheatley, 1999: 20).

Strange attractors, which have been extensively referred to in this chapter, are an example of processes enabling autopoiesis. The occurrence of strange attractors are not, however, always present or effective in systems, as would be the case of systems in total equilibrium (death) or total randomness (anarchy) (Uys, 2002: 38). A system needs some kind of reference signal, of which identity would be an appropriate example, to stay in *"the domain between linearly determined order and indeterminate chaos"* (Waldrop, 1992), the domain of complexity.

The symbiotic and synergetic relationship between identity and adaptability would serve as an illustration of the relationship between positive- and negative feedback. Both processes (identity and adaptability) may be identified as either positive – or negative feedback depending on the context, but the presence of both qualities enables a balance between the destabilizing and reinforcing processes on the one hand, and the stabilizing processes on the other hand.

Let us continue the discussion of identity by turning to leadership related literature.

COMPLEXITY AND LEADERSHIP LITERATURE

The identity of a leader continually develops as a result of an emerging process based on dynamic interaction between the leader and the environment (proposition 1.4).

As is the case with a number of the other meta-competencies, identity is a deep and dynamic cognitive process which to some extent has relevance to all aspects of leadership behaviour. However, let us examine the role of identity related to complexity and leadership in further detail.

The meta-competency of identity recognizes the fact that leadership goes beyond face-to-face interaction and the direct leadership attributes of the leader (Wong et al, 2003: 6). Particularly, strategic leadership speaks for a basis of defining the leadership role through the accomplishments of subordinates (Briscoe & Hall, 1999: 49) and catalyzing success through lower level empowerment (Wong et al, 2003: 6).

From this it follows that complex leaders favour an indirect approach to leadership, in which the leadership focuses on how to *make things possible* through facilitation of emergent processes instead of *making it happen* through top-down and directing behaviour (proposition 3.4).

A complexity oriented leader is an important asset in developing the identity of the organization by acting as sense-makers (proposition 3.3). By interpreting emerging events through correlation of language and symbols (Lichtenstein et al, 2009: 624-625), and storytelling linking the history of the system with the present situation, leaders take role as "tag" which serves as a direction setter of valued behaviour by identification of what is essential (Lichtenstein et al, 2009: 625).

A Complexity Approach to leadership further points to the importance of intangible processes such as vision, values, ethics and identity (strange attractor) as an emergent system's reference signals (proposition 3.8). The attractors emerge as an evolutionary process in which leadership participates (Osborn & Hunt, 2007: 329, 332; Stacey & Griffin, 2005: 106, 116-117, 121-122).

The next step is to substantiate briefly the need for the meta-competency of identity in a military context.

MILITARY CONTEXT

One of the main purposes of modern military technology is to reduce the "fog of war" by increasing predictability and as a result reduce uncertainty (Calhoun, 2004: 8).

Clausewitz, however, states that *"one of the most serious sources of friction in war is the difficulty of accurate recognition and assessment of one's own strength and performance, much less the enemy's"* (William, 2003: 27).

With reference to all the contextual discussions of this chapter there is a clear pattern of great complexity in contemporary military operations. The asymmetry of operations requires leaders to have a keen insight of their own individual and structural thinking patterns in order not to fall victim to outdated assumptions and wishful thinking (William, 2003: 27). However, military leaders are also called for "*change*[ing] *one's self-concept as appropriate"* (Briscoe & Hall, 1999: 49), adapting their own behavior and facilitating institutional transformation to the *de facto* need of the situation.

This dissertation will now continue with a brief empirical evaluation.

The question of identity in the empirical setting of this dissertation is obviously not a question if the subjects of research have an identity or not, but rather, if their identity is adapted to the world of complexity.

As suggested by the empirical discussion of chapter 6 and chapter 7, there is a considerable gap between the normative perceptions and the descriptive behaviour among the Norwegian military officers as it relates to issues of complexity.

The discussions of this chapter also indicate that the identity of the Norwegian military officers and Norwegian Armed Forces are *outdated* as it relates to adaptive challenges of complexity, a claim also supported by Nissestad (2007: 286).

The next step is to elucidate the last meta-competency: courage.

8.1.9 Meta-Competency Eight - Courage

"Life shrinks or expands in proportion to one's courage", the French author Anais Nin claims, and Greek philosopher Plato suggests that courage is one of the cardinal virtues, the virtues that all other virtues derive from (Miller, 2005: 5).

Despite the proposed relevance of this meta-competency, courage as a research subject has not received much attention; something that might be explained by the difficulties of generating a consensus-based definition (Woodward & Pury, 2007: 135; Rate, 2007). The entanglement of the many different forms of courage (Miller, 2005: 2), and the inherently complex construct of a heterogeneous variety of traits constituting courage (Rorty, 1986: 151; Rate, 2007), makes the definite boundaries of what is courage or not, fundamentally unclear.

The most traditional way of perceiving courage is that it is connected to *physical courage* and often with a military connotation. Courage may also be interpreted from an *ethical or moral* perspective as representing action due to a threat to one's ethical or moral integrity. One may also perceive courage from a psychological angle where it is displayed in terms of one's encounter with own cognitive or psychological challenges, for instance anxiety (Woodward & Pury, 2007: 137).

What is believed to be a courageous action is often identified against what one would relate to being dangerous, difficult, risky or fearful. The constitution or competence of the individual being assessed towards the situation also affects whether the action is perceived to be courageous or not, as the individual might possess qualifications that minimizes the risk (Rorty, 1986: 160). For instance, making a parachute jump might be considered as being a courageous (or stupid) action by some people, but for an instructor in parachuting with years of experience it is routine and not perceived to be particularly courageous.

Based on these observations the definition of courage may be presented as *"the voluntary willingness to act, with or without varying levels of fear, in response to a threat to achieve an important, perhaps moral, outcome or goal"* (Woodward & Pury, 2007: 136).

Exposure to what one finds fearful, and preparation for action (Rorty, 1986: 161; Woodward & Pury, 2007: 136) are thought to be important factors in developing one's own capacity of exhibiting courage, which requires some level of robustness and mental toughness (Kit, 2008: 8). Miller (2005: 21, 24) further speaks for the importance of education and habituation of developing courage and proposes the use of stories and heroes as a facilitating mechanism.

This dissertation will also argue for the relevance of the other meta-competencies in developing courage.

The elucidation of courage in the framework of complexity literature now follows.

COMPLEXITY LITERATURE

The characteristics of a complex system strongly imply the need for the meta-competency of courage as any organic system requires *risk-taking and facing the fear of the unknown* due to the fact that:

- Complex systems are non-linear and open systems,
- The boundaries of a complex system are dynamic and provisional,
- Complex systems do not behave rationally or logically, but exhibit surprising and perhaps contradicting behaviour,
- The outcome is based on a process of emergence between locally interacting agents, and

- Complex systems operate far-from-equilibrium.

Let us proceed to complexity and leadership literature.

COMPLEXITY AND LEADERSHIP LITERATURE

In the Newtonian "paradigm of order "(Geyer, 2003: 3), leadership is essentially about attaining control and order in a world thought to be deterministic and closed (Juarrero, 2007: 110).

From a Complexity Approach to leadership perspective, on the other hand, control and order may have contradicting meanings in the sense that control is best obtained through decentralization, and order may be connoted to negative metaphors such as death and standstill.

Complexity oriented leaders must thus exhibit a great deal of courage as:

- Complex leaders disrupt existing patterns (proposition 3.1), thus deliberately manipulating the system to go from perceived stability and certainty to instability and uncertainty.
- Complex leaders lead by simple rules (proposition 3.2), favour an indirect approach to leadership (proposition 3.4), support bottom-up processes (proposition 3.5), value the informal processes in an organization (proposition 3.6) and encourage novelty (proposition 3.7) implying immense courage to *trust* the emergent processes, to lose the *perception of control*, to challenge *existing paradigms and deeply held assumptions*, and to *think differently*.
- Complex leaders must trust its intuition and soft guiding mechanisms (proposition 3.9) in a rapidly changing and interconnected world where rational and objective decision making processes perhaps have less relevance.

A discussion of courage in the context of complexity literature, complexity and leadership literature, are also largely relevant for the contemporary military context.

MILITARY CONTEXT

The discussions of the contemporary military context in this chapter have emphasized the impact of mega-trends such as globalization, technological development and demographics (O'Brien& Robertson, 2009: 371-373), the use of military forces in a wide spectre of operations (Chan, 2006: 2), and the entanglement of military, social, economic, political, technological and environmental variables fighting state and non-state actors combining symmetric and asymmetric methods (Strategic Trends Programme, 2010: 13; Schmitt, 1999: 104).

More specifically, a Network Centric Approach to Warfare, presupposes the avoidance of centralized leadership in most cases and propagates a decentralized approach to leadership and trust as essential criteria for success (Sagen, 2008: 61).

The leadership implications of complexity do to some extent speak for a paradigm shift in military leadership where the traditional conservative military leadership skills lose ground compared to more intangible and soft oriented models, and qualitative approaches. This dissertation finds it reasonable to suggest that a high level of courage is necessary to implement these leadership strategies, as it may be subject to controversy and resistance against change.

This dissertation has put forward the argument that the contemporary military context is fundamentally versatile and uncertain. Furthermore, this dissertation will argue that this fundamentally versatile and uncertain military context requires a high level of *moral* and *psychological* courage amongst its leadership.

EMPIRICAL EVALUATION

The empirical research considered in this dissertation does not create the proper basis to evaluate the meta-competency of courage in relation to the Norwegian military officers or the Norwegian Armed Forces.

Through a process of synthesis, this chapter has identified, articulated and discussed the meta-competencies of heterogeneity of degree, androgynousity, cognitive flexibility, ethical reasoning, cross-cultural competence, intuition, identity and courage as highly relevant for leadership in complex military systems.

The purpose of the next section of this chapter is to propose a cloud model in which the proposed meta-competencies are thought to be interrelated and interdependent.

8.2 A Cloud Model of Interrelated and Interdependent Meta-Competencies

Let us initiate this section by revisiting the novel definition of competencies and meta-competency presented in the previous chapter.

Competencies are interconnected underlying characteristics of an individual or system, which through a dynamic and non-linear process of interaction between local agents and the environment contribute to the emergence of identifiable or unidentifiable patterns of individual or systemic behaviour.

Meta-competency is characterized as *a competency that is so powerful that it affects the person or system's ability to acquire other competencies.*

So far, the meta-competencies in this chapter have been presented as isolated meta-competencies for leadership in complex military systems.

In the domain of complexity the reality being researched consists of multi-dimensional phenomena (Klein, 2004: 6) where a reductionist approach would not merely be a technical error, but also an ethical one (Cilliers, 2005: 260).

Hence, the meta-competencies for leadership in complex military systems must be interpreted as interrelated and interdependent meta-competencies with contextual relevance

(Hollenbeck et al, 2006: 399-400; Pollit & Bouckaert, 2003: 5). As complex systems are open, non-linear and organic systems (Cilliers, 1998: 4), every situation is in principle a unique situation (Stanley, 2009: 49), naturally resulting in a dynamic and ever changing relationship between the meta-competencies.

Based on these observations this dissertation suggests the metaphor of a cloud as a suitable representation of the model framework (figure 34).

Figure 34 - Cloud model of interrelated and interdependent meta-competencies for leadership in complex military systems

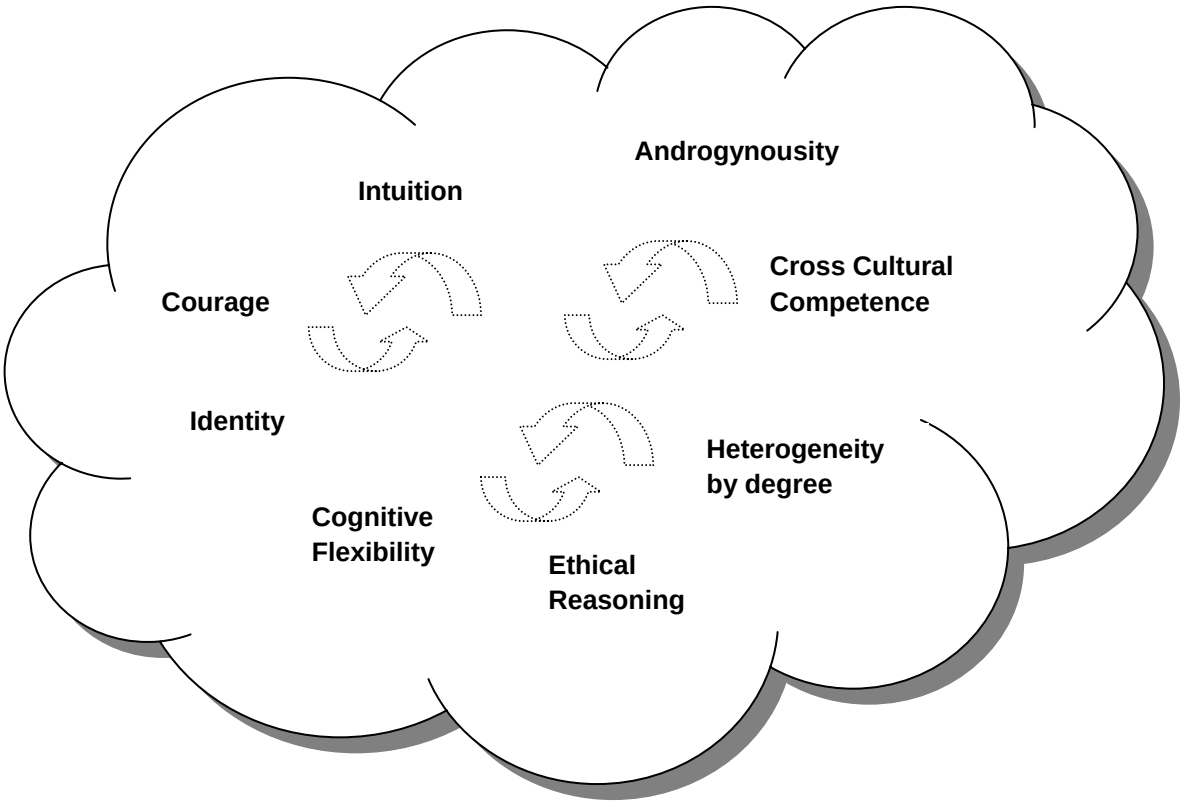

Figure 34 - Cloud model of interrelated and interdependent meta-competencies for leadership in complex military systems

This suggestion may be substantiated by the occurrence of the following properties of clouds:

- The boundaries of a cloud are inherently “fuzzy” and dynamic, and it is often difficult to precisely determine where one cloud stops and the next one ends.
- The structure constantly changes and the relationship between atoms is constantly renegotiated.
- The various atoms of a cloud interact locally to co-create the emergence of patterns (greater systems of clouds or weather systems for instance).
- Clouds symbolize incredible *potential,* with particular reference to the appearance of thunder and lightning, an immense amount of energy released as a result of diverse atoms interacting. Clouds are also life giving in the sense that they absorbs- and redistribute water.
- Clouds may be high- or close to the ground, fully covering the horizon or not being present at all, something which underlines that it has context dependent relevance.

Having illustrated the symbiotic and synergetic relationship between the meta-competencies it is worthwhile discussing the application of the cloud model in some macro settings relevant to leadership in complex military systems.

8.3 Application of Cloud Model

The purpose of this section is to discuss the application of the cloud model in different macro settings relevant to complex military systems.

Due to the unending number of variables interacting dynamically in complex systems, an artificial frame or structure must be imposed on the system in order to present something meaningful (De Villiers & Cilliers, 2004: 47). The learning process of a complex system is also subject to a process of selection as the system must be stable enough to avoid using energy on every fluctuation, but at the same time be sufficiently plastic in order to adapt when required (Sturmberg & Cilliers, 2009: 882-883).

The following illustration of the applicability of the cloud model to certain macro settings (figure 35) is therefore inevitable, as every other model, a generalization of identified patterns in that given frame, and a tool of provisional knowledge (Osberg et al, 2008: 219).

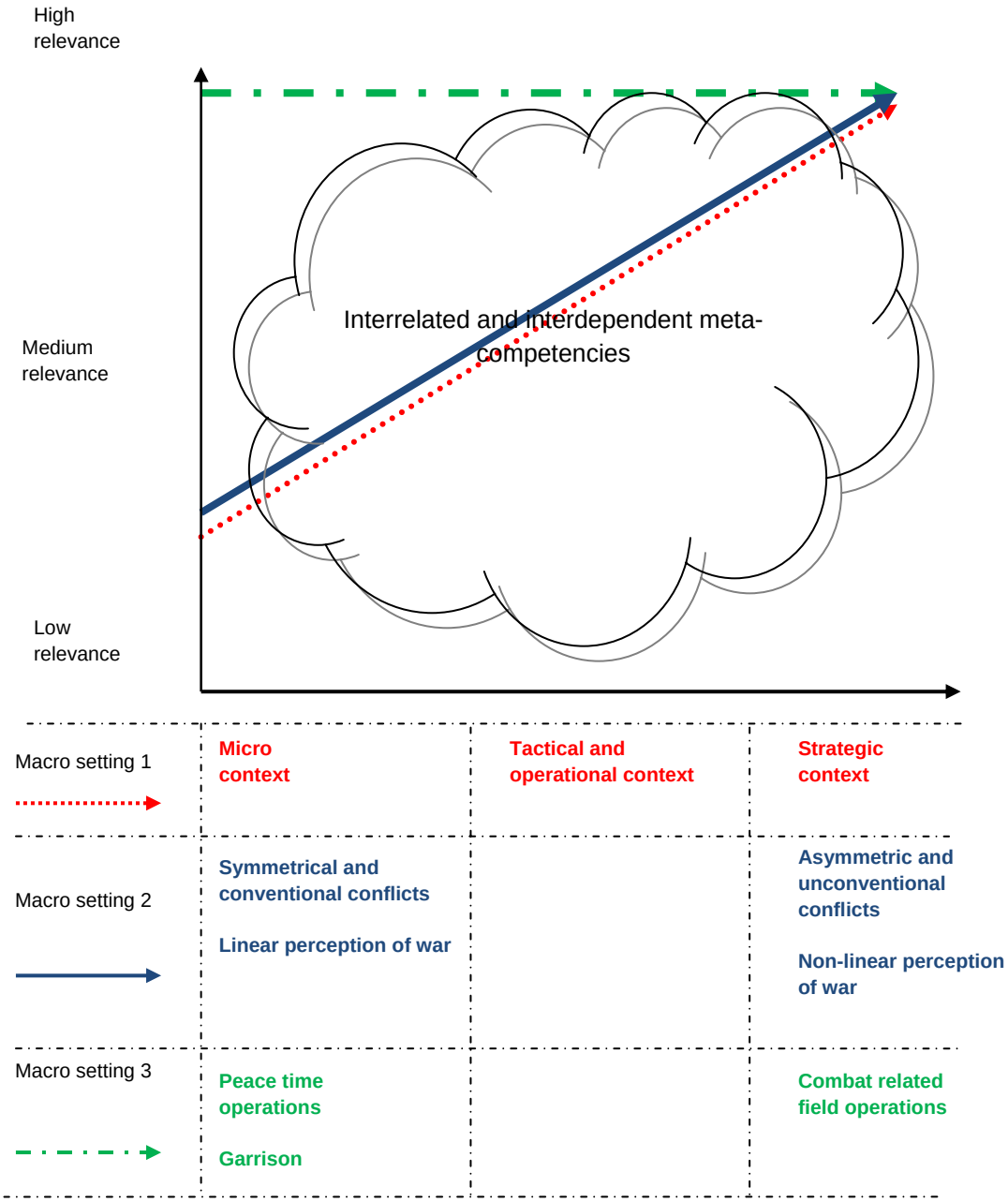

Figure 35 - Application of model in macro settings

The three macro settings will now be elaborated on starting with macro setting one.

8.3.1 Macro Setting One

This dissertation argues that the meta-competency model for leadership in complex military systems has low to medium relevance in a military micro[41] context, medium relevance in a tactical[42] and operational[43] context and high relevance in a strategic[44] context.

Cook (1999: 5) states that in the realm of a strategic context conventional leadership wisdom is insufficient and that success in this setting is based on novel approaches. Walker (2006: 31) suggests that the strategic context requires senior level leaders with creative and abstract cognitive capacities, inter-institutional social capabilities, paradigm shifting change capacities and stewardship as professional ideology. The domain of a strategic context is unquestionably characterized as being uncertain, unanticipated and ambiguous (Cook, 1999: 5) and due to the complex social and political environment of the strategic realm leaders need to possess particularly high emotional intelligence (Kit, 2008: 4).

Larsen (2006: 116) argues that there are big differences in required competencies between leaders in strategic and micro environments. A strategic context requires systems' leadership with a high degree of cognitive complexity and adaptive capacity (Wong et al, 2003: 661; Larsen, 2006: 116). The operational and the tactical context emphasize organizational leadership and management of organizational processes within the framework established as the strategic level. Wong et al (2003: 671) characterize this domain as *"the buffer between external environmental turbulence and the rational focus of the lower levels"*. A micro context is characterized by direct and concrete processes that require direct leadership and the time-horizon of this context is normally short ranged. Leadership foci are often defining goals, directing actions and monitoring and evaluation of progress (Wong et al, 2003: 675; Walker, 2006: 31; Larsen, 2006: 116).

With reference to the discussion in chapter 3 of the difference between what is complicated and what is complex, this dissertation would, of course as a generalization, suggest that the requirements of leadership in a micro context tend towards competencies for a complicated

[41]A micro context refers to the execution of low scale military missions "on the ground", for instance the sphere of each individual soldier and lower levelled units (Wong et al, 2003: 662)

[42]A tactical context refers to the disposition of the different branches of the Armed Forces or higher level units in the branches (for instance a Division) (Vinje, 2007) to achieve combat objectives (Wong et al, 2003: 662; Answers.com (1)).

[43]An operational context refers to a setting in which major operations and campaigns are planned and conducted within a broader dimension of time and space than a tactical context (Answers.com (2)).

[44]A strategic context may, as defined by the United States Department of Defense, refer to as *"the level of war at which a nation, often as a member of a group of nations, determines national or multinational (alliance or coalition) security objectives and guidance, and develops and uses national resources to accomplish these objectives" (*Wong et al, 2003: 662; Answers.com (3)).

world and that leadership in a strategic perspective requires competencies for a complex world (figure 36).

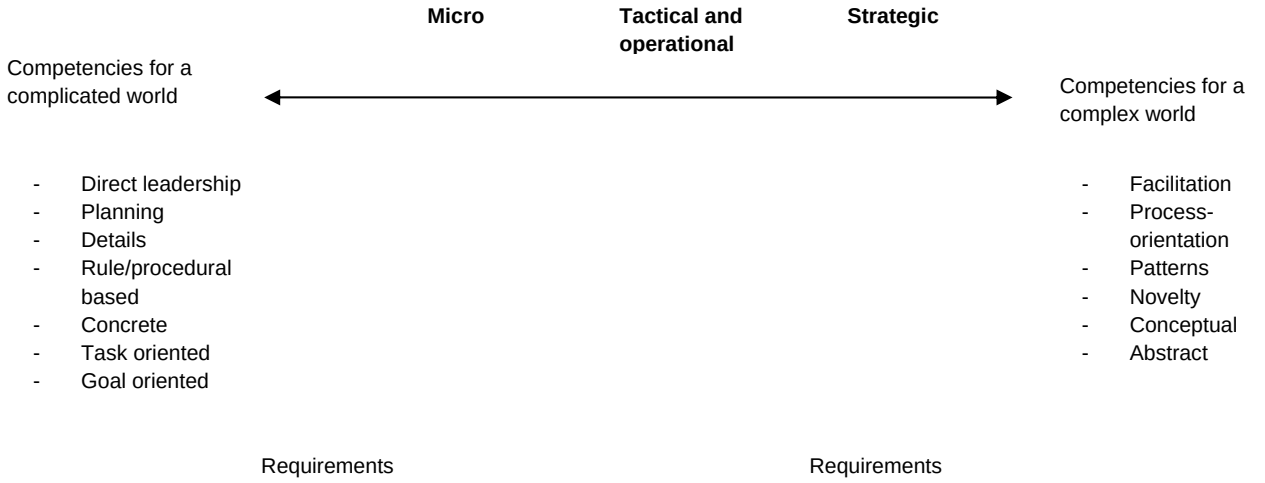

Figure 36 - Leadership context and required competencies

The boundaries of a interconnected complex system is however diffuse, and as discussed throughout this chapter, military leaders on all levels are subject to a great deal of adaptive challenges.

The considerations and actions of leaders in a micro context might grow to pose huge problems for the tactical, operational and strategic level, substantiating the emergent properties of military operations. A strategic context, with the proposed competencies for a complex world, is therefore not merely linked to a certain level, for instance high leveled officers, but may as well to some extent be representative for lower levels in the hiearchy. It might be more fruitful to associate a strategic context and strategic leadership capacities to those who are concerned by external domains of influence and who are subject to great levels of complexity (Wong et al, 2003: 1), not the level of rank or the level of the insitution.

Hence, this thesis will, as illustrated in figure 36, argue that the meta-competency model for leadership in complex military systems is also to some extent applicable to a micro military context.

Let us continue by examining macro setting two.

8.3.2 Macro Setting Two

This dissertation argues that the meta-competency model for leadership in complex military systems has low to medium relevance in symmetrical and conventional conflicts and high relevance in asymmetric and unconventional conflicts.

A symmetrical and conventional perception of warfare may be connected to the metaphor of *"a collision between two billiard-balls"*(Ilachinski, 1996: 46), where two main sources for success is scale of manpower and firepower (Bar-Yam, 2003: 1).The military organizational structure in attrition warfare is often described as bureaucratic and hierarchical (Adams, 2000: 55; Bar-Yam, 2003: 1, 8), which is highly suitable for large scale and conventional operations in stable environments (Robbins et al, 2002: 124).

A more complexity oriented perception speaks for a view of military organizations to be non-linear and open systems which engage in war characterized as "*an organic exchange of energy, matter and information"* (Schmitt, 1999: 104). The contemporary military context which has been characterized throughout this chapter reveals an environment far from being stable. A myriad of economic, environmental, socio cultural, political and technological variables, non-state and state actors, governmental organizations and non-governmental organizations co-create an environment which is highly complex and requires a high adaptive capacity from military officers and military organizations.

Requirements for success in closed and symmetrical systems is apt to competencies supporting optimization, for instance formalization and planning, whereas requirements in an open and dynamic system is linked to the facilitation of adaptive properties through means such as network-orientation, decentralization and process-focus (figure 37).

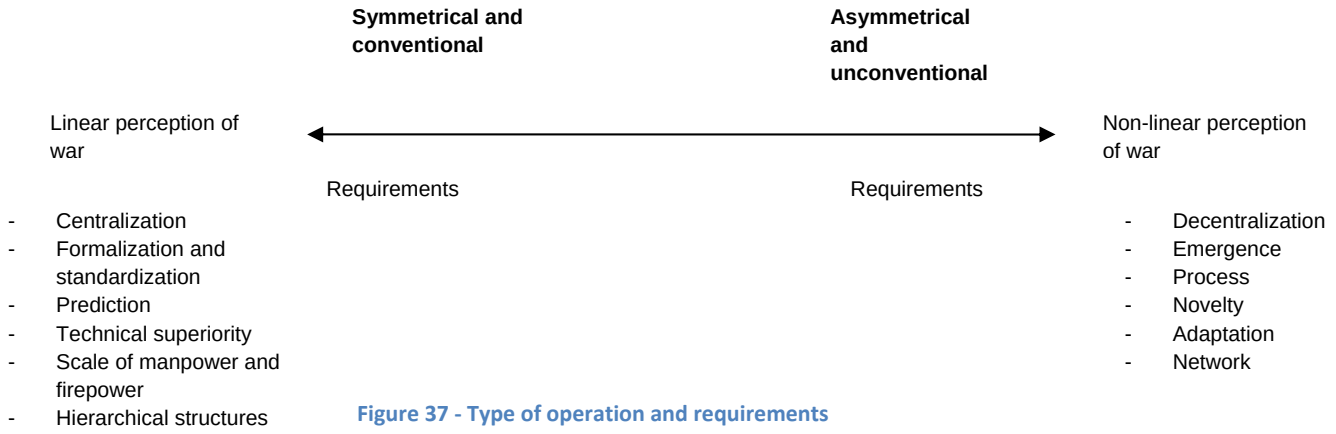

Figure 37 - Type of operation and requirements

The purpose of a meta-competency model is to *enable a condition* of autopoiesis and can as such both act as positive and negative feedback depending on the status of the system. Attrition warfare might be highly effective under certain conditions where neither positive nor negative feedback is required, but only maintenance of status quo. Successful conventional warfare campaigns are, despite of possible overwhelming scale of manpower or firepower, still dependent on some kind of adaptive properties as the environment can seldom be characterized as being stable. Consequently the most essential element remains human beings. Hence, as a generalization this dissertation states that the meta-competency model has low to medium relevance in a conventional framework of war.

An asymmetrical and unconventional approximation to war or war-like operations, like many of the current contemporary military are, require great adaptive capacity in order to deal with the complexity. This dissertation will argue that the meta-competency model is an indispensable tool for developing adaptive capacity in times of rapid change and great complexity.

The third and last macro setting will now be discussed.

8.3.3 Macro Setting Three

This dissertation will argue that the meta-competency model for leadership in complex military system is as highly relevant for peace time management of military organizations in garrison, as it is for combat related field operations[45].

The peace time management of military organizations is often subject to a highly bureaucratic approach (Dent et al, 2000: 90-105) in which formalization of processes is essential for the development of optimized, effective and efficient solutions (Robbins & Barnwell, 2002: 125).

While combat related field operations and peace time management of military organizations may differ in context, a number of the individual and organizational competencies remain highly similar (Wong et al, 2003: 677).

[45]Please read this in conjunction with the discussion in macro setting two. The purpose is to highlight that despite the dissimilarities in context, the demand for individual and institutional capabilities, that is, adaptive properties, is to a large extent similar.

As thoroughly discussed and proposed in chapter 5, a Complexity Approach, and thus the meta-competency model, is as relevant for the peace time organization as for the war time organization, as the fundamental characteristics of a complex system is embedded in both structures.

The last task of this chapter is to summarize the most important points in the following section.

8.4 Summary

The purpose of this chapter was to propose a novel meta-competency model for leadership in complex military systems. The following research objective was formulated.

Research objective 6: Based on a model-building study, to develop a meta-competency model for leadership in complex military systems.

Research objective 7.1: To present and discuss the identified meta-competencies.

Through a process of synthesis of three research designs, namely non-empirical literature study, empirical research and model building study, this dissertation suggests the following meta-competencies for leadership in complex military systems:

Heterogeneity of degree, androgynousity, cognitive flexibility, ethical reasoning, cross-cultural competence, intuition, identity and courage

Research objective 7.2: To present and discuss the interrelated and interdependent properties of the meta-competency model.

This dissertation argues that the meta-competencies for leadership in complex military systems are interconnected and interdependent, and must not be interpreted in isolation.

The metaphor of a cloud is presented as a suitable image of the Complexity Principles and the interrelated and interdependent meta-competencies are therefore shaped into a cloud model.

Research objective 7.3: To present and discuss the application of the proposed meta-competency model.

Three different macro settings are presented with the view to discussing the relevance of the meta-competency model.

In the first macro setting it is argued that the meta-competency model for leadership in complex military systems has low to medium relevance in a micro context, medium relevance in a tactical and operational context and high relevance in a strategic context.

In the second macro setting this dissertation proposes that the meta-competency model has low to medium relevance to symmetrical and conventional conflicts and high relevance in asymmetric and unconventional conflicts.

In the third and final macro setting it is suggested that the meta-competency model is as highly relevant for the peace time management of military organizations in garrison, as it is for combat related field operations.

Next chapter will present the conclusions and summaries of this thesis.

Chapter 9: Summary and Conclusions

The purpose of this dissertation is to develop a meta-competency model for leadership in complex military systems.

The different chapters, each having achieved a different objective, will be consolidated in this final chapter with the view to summarising the findings that connect these objectives. The presentation will be organized in a chronological sequence starting with chapter 1 and ending with chapter 8.

Chapter 1: Introduction

The purpose of this chapter was to introduce the topic of the study and describe how this dissertation is organized to answer the research question.

The background for this study is based on the emergence of an increasing complexity in society and aims to show how a Complexity Approach in social organizations might contribute to more sustainable and resilient systems.

“A Complexity Approach” is chosen as a collective term of pluralistic and dynamic approximations to increase a “bounded” adaptive capacity for individuals and systems, where principles of non-linearity, disequilibrium, interconnectedness, feedback-loops and self-organizational processes are essential.

Large scale transformation of Western military organizations in the post Cold-War era and increasing complex challenges due to asymmetry, a wide range of operations from humanitarian disaster relief to more regular war-like situations, multinational- and joint forces, and demands on interoperability between military and non-military actors, makes it necessary, and indeed interesting, to investigate how leadership in a military framework should be effectuated to respond adequately to the trend of increasing complexity.

The research design’s non-empirical literature review, empirical survey and model-building study are used to substantiate the research question which is formulated as follows:

What meta-competencies are desired in order to effectuate leadership in complex military systems?

Given the possible impact of complexity, and the theories associated with this phenomenon, a number of research objectives are formulated which may be used to link complexity to essential aspects that serve the purpose of this dissertation.

1. Based on a non-empirical literature review, define and describe a Complexity Approach and differentiate it from what is understood by an orthodox Newtonian Theory.
2. Based on a non-empirical literature review, investigate the implications of a Complexity Approach on leadership and how it differs from the traditional characteristics of leadership.
3. Based on a non-empirical literature review, investigate the implications of a Complexity Approach in military organizations.
4. Based on an empirical survey, describe and analyze Norwegian Officers' worldview against the principles of a Complexity Approach and leadership in complex systems.
5. Based on a model-building study, develop a meta-competency-model for leadership in complex military systems.

This dissertation will provide three novel contributions to the emerging literature on complexity. Firstly, a novel definition of competencies will be proposed. Secondly, a set of desirable meta-competencies for effective leadership in complex military systems will be synthesized based on the research design and thirdly and finally, a cloud model of interrelated and interdependent meta-competencies will be presented which emphasises the symbiotic and synergetic relationship between the identified meta-competencies and the inherent provisional and unclear boundaries of the meta-competency model.

This study will now continue by summarizing the most important features of chapter 2, Research Design and Methodology.

Chapter 2: Research Design and Methodology

The intention with this chapter was to outline the research design and methodology applied in order to answer the research question of this study.

Three research designs substantiate the development of a meta-competency model of leadership in complex military systems.

First of all, non-empirical literature reviews, i.e. *"studies that provide an overview of scholarship in a certain discipline through an analysis of trends and debates" (*(Mouton, 2001: 179), provide the theoretical basis for the empirical research and model-building study by reviewing literature on complexity, leadership and military organizations.

Second, an empirical survey, i.e. "*studies that are usually quantitative in nature and which aim to provide a broad overview of a representative sample of large population"* (Mouton, 2001: 152), aim to reveal patterns of attitudes towards Complexity Principles among the sample using primary and secondary data.

A non-probability convenience sampling method is applied on the subjects of study namely, the Officers of the Norwegian Joint Staff College, using a measuring instrument developed by Rønn (2009) and adjusted to meet the specific needs of this dissertation.

The data is collected using a structured, self administered and paper-based questionnaire with closed-ended questions, and further captured in SPSS, and analyzed using quantitative methodology and descriptive statistics.

This dissertation has identified that method variance, data collection in a single point of time, single sample and number of questions per factor might be considered as possible shortcoming and sources of error.

Third, a model building study, i.e. *"studies aimed at developing new models and theories to explain particular phenomena" (*Mouton, 2001: 176), seeks to develop an *ideal type* of desired meta-competencies for leadership in complex military systems.

The model is developed through a process of *synthesis* between the non-empirical and empirical part of this dissertation.

Complexity has been forwarded as the main topic of this dissertation. The next section will highlight the most significant findings of chapter 3, Complexity: A Conceptual and Theoretical Analysis.

Chapter 3: Complexity: A Conceptual and Theoretical Analysis

The purpose of this chapter was to define and describe a Complexity Approach and differentiate it from what is understood by an orthodox Newtonian Theory.

A Newtonian conception assumes complete representation of phenomena through principles of reductionism, determinism and closed system thinking, while a Complexity Approach represents a shift from a set of conservative laws to a perception of the world as an open and highly dynamic system.

Due to the nature of complexity, no general or uniform definition of complexity readily exists. Perhaps the most well known definition of complexity is offered by Waldrop (1992) who

illustrates the boundaries of complexity by referring to it as "*the domain between linearly determined order and indeterminate chaos".* A more process-oriented definition is offered by Zimmermann and Plsek (1998) who describes complex phenomena as "*systems characterized by nonlinear interactive components, emergent phenomena, continuous and discontinuous change, and unpredictable outcomes".*

Complexity may be perceived to be, amongst others, a science, a method of thought, a specific worldview or perhaps more accurately a combination of all of the above. From a more meta-position one could state that the complexity sciences represent a bridge between modernism on the one hand and post-modernism on the other hand.

Complex systems have different characteristics, for instance they consist of a large number of short ranged interactions which are dynamic, non-linear and fairly rich. The patterns of these systems are codetermined through a dynamic process between the history of the system and the interaction with its local environment.

Certain conditions may be identified as necessary, but not automatically sufficient conditions for complexity. *Emergence* is about how patterns over time develop as a result of interaction between parts of a system. *Non-linearity* refers to something being disproportional and is essential for complexity to grow from simplicity, or vice versa. *Disequilibrium*, for instance non-linearity and chaos, provides incentives for change and keeps a system far-from-equilibrium. *Feedback* refers to how any action might loop back to the origin of the action, affecting the initial settings and consequently change the original action. This feedback may be stabilizing (negative) or destabilizing (positive). *Self-organization* may be referred to as *"* […) *a property of complex systems which enables them to develop or change internal structure spontaneously and adaptively in order to cope with, or manipulate, their environment"* (Cilliers, 1998: 90).

Based on the discussions of this chapter some general observations are articulated that impact the further research of this dissertation.

- Complexity entails multiple dimensions of reality
- Complex phenomena are inherently vague
- Complex behaviour is dependent on enabling boundaries
- Heterogeneity enables complexity
- Complexity requires "bounded" adaptive capacity
- Complexity requires a fundamental relational focus

A complexity perception of phenomena has implications for the purpose, role and behaviour of leadership. The next section will highlight some of these implications.

Chapter 4: Complexity and Leadership: A Conceptual and Theoretical Analysis

The purpose of this chapter was to discuss the implications of a Complexity Approach for leadership.

A common denominator of definitions of leadership that support a traditional perception of leadership includes interaction where intentional influence by one person over another person or persons is present.

The contemporary leadership debate is represented by a high number of different theories manifested in different approaches to research and does not present a uniform perception. One may argue that a meta-trend is: the purpose of leadership is to optimize through incremental processes and maintain or create stability and predictability. Incidentally this would be a highly Newtonian conception.

A Complexity Approach to leadership argues that leadership might be better described by the *dynamics of emergence* that requires an *enabling* leader that balance between providing *freedom in addition to constraints.*

The context of a Complexity Approach to leadership is characterized as highly unpredictable with unclear boundaries. A Complexity Approach to leadership further implicates both *individual- and systemic* perspectives, and how the *role* and *work* of a complex leader arises as a result of an emerging process based on a dynamic interaction between human beings and the environment

Specific leadership behaviour is articulated substantiating the purpose of complexity oriented leadership:

- Complex leaders disrupt existing patterns
- Complex leaders lead by simple rules
- Complex leaders act as sense-makers
- Complex leaders favour an indirect approach to leadership
- Complex leaders support bottom-up processes
- Complex leaders value the informal processes in an organization

- Complex leaders encourage novelty
- A Complexity Approach to leadership substantiates the importance of vision and values as core elements of an emergent system's reference signal
- Complex leaders focus on soft values
- Complex leadership mainly focus on micro-level interactions between people

Chapter 5: Complexity and Military: Context, Linkages and Implications

The purpose of this chapter was to investigate the implications of a Complexity Approach in general military activity.

The characterizations of the reigning paradigm in military organizations are closely linked to Newtonian Principles of linearity, reductionism, determinism and closed system's thinking. The quest for control, equilibrium and stability are central aspects that permeate every function of the military organization, whether it is battle, structure or doctrine. The high degree of formalization and top-down control mechanisms are linked to an autocratic and bureaucratic organizational structure.

This dissertation does, however, conclude that using the proposed characteristics of complex systems (Cilliers, 1998), any military organization may be labeled as a complex system that consists of a large number of short ranged interactions which are dynamic, non-linear and fairly rich, and where patterns of the system are codetermined through a dynamic process between the history of the system and the interaction with its local environment.

Ilachinski (1996) argues that a Complexity Approach is applicable to military organizations in a number of ways. It may affect the metaphors, policies, conventional models, combat technology, combat aids and conceptualization of war.

From a complexity point of view, war can be understood as a non-linear system with self-organizational and emergent properties. It is open, distributed, dynamic, and small changes to initial conditions might grow to become big changes through positive feedback-loops. The notion of war being characterized as a clash between two billiard-balls is therefore substituted by a perception of war as an organic exchange of energy, matter and information.

This chapter proposes specific actions in terms of doctrine, strategy, structure, policy making, planning and analysis, and training, which is argued to increase the adaptive capacity for military organizations.

This study will now continue with a summary of the most important findings of the empirical survey.

Chapter 6: A Complexity Approach in a Military Leadership Environment: The Case of Norwegian Military Officers

The purpose of this chapter is to clarify the Norwegian Military Officers' relationship to Complexity and Newtonian Principles.

The results may be regarded as an aid for the descriptive and normative evaluation of what the Norwegian Military Officers find important in order to deal with organizational challenges.

This dissertation makes use of SPSS (Statistical Package for the Social Sciences) and descriptive statistics reporting frequencies for all respondents and across demographic groups.

The survey had a total of 61 participants from the Joint Staff College distributed on two educational levels, the Staff Officer Course and Masters Degree Study with 77% and 23% of the respondents respectively. The participants were mostly males (92.0%) in the rank range of Captain, Major and Lieutenant Colonel with an average age of 40 years. 39.3% of the participants had Army background, 26.2% Navy, 29.5% Air Force and 4.9% were Civilian.

The following Newtonian trends where identified:

- Trend 1: A Complexity perception of conflict, chaos and disruption are perceived to be dysfunctional
- Trend 2: The Officers are highly goal-oriented
- Trend 3: The Officers believe that rational mechanisms such as long term planning and prediction are crucial in order to achieve success
- Trend 4: The Officers believe in leadership dependence, a person-oriented leadership and (a traditional) "hard" leadership style

The following Complexity trends were identified:

- Trend 5: The unpredictability and uncertainty of the Armed Force's milieu necessitates adaptation
- Trend 6: Decentralization and change is perceived to be something positive
- Trend 6: The Officers perceive themselves to be informal leaders that encourage novelty

- Trend 7: Emotional intelligence and relationship-orientation are essential aspects of leadership

A comparison between the responses of Army, Navy and Air Force were conducted revealing a highly homogenous pattern.

A survey was conducted at the Norwegian Military Academy by Rønn (2009) investigating the Cadets' relationship to Complexity and Newtonian Principles.

Using the same measuring instrument at the survey conducted at Joint Staff College, this dissertation compared the results from the two surveys with the view to identifying any similar or dissimilar patterns in the two samples' responses.

The main trend in the comparison between these two is the notion of homogenous thinking, whereas the responses in the two surveys are highly similar.

Chapter 7 – Complexity and Competencies - The Framework of a Meta-Competency Model for Leadership in Complex Military Systems

The purpose of this chapter is to present and discuss the framework for a meta-competency model for leadership in complex military systems.

Competencies, which may be defined as *"an underlying characteristic of an individual that is causally related to effective and/or superior performance in a job or situation" (*Thach & Thompson, 2007: 357; Briscoe & Hall, 1999: 37), is a person-centred guiding mechanism that provide a common language for an organization.

The public sector distinguishes itself from the private sector in a number of ways, for instance in terms of judicial constraints, ethical considerations and demands of accountability. In that way one would anticipate that the required competencies for a public manager are different from those required from a private sector manager. Empirical evidence however is not conclusive and context is an important variable to take into consideration.

Globalization, rapid technological developments and a highly interconnected environment raises questions of what competencies military leaders should have in order to cope with adaptive challenges. Asymmetry, multinational forces, international cooperation and an integration of political, environmental, economic and socio-cultural spheres are all factors that contribute to the complexity which meet military forces in current- and most likely future conflicts.

An investigation of empirical research conducted on Norwegian Military Officers or the Norwegian Armed Forces as a system, and the findings of this dissertation, reveals two relatively distinct patterns. First of all, there is considerable amount of homogenous force in the Norwegian Armed Forces, both from an individual and a systemic perspective. Secondly, the normative perspective among the respondents reveals an acknowledgement of complexity and uncertainty, while the descriptive data indicates that the officers rely on mechanisms of stability and control.

These patterns are anticipated to reinforce the *status quo* and inhibit both the individual and system from developing an adaptive capacity that is argued to be essential to cope with complexity.

Based on a complexity understanding of the world this dissertation proposes a novel definition of competencies as follows:

Competencies are interconnected underlying characteristics of an individual or system, which through a dynamic and non-linear process of interaction between local agents and the environment contribute to the emergence of identifiable or unidentifiable patterns of individual or systemic behaviour.

In order to substantiate the proposed definition this thesis includes a discussion of modesty, vagueness and boundaries, all of which are important aspects that enable us to *understand* some of the rationale behind the formulation of the definition.

This dissertation argues that meta-competencies, which may be defined as *a competency that is so powerful that it affects the person's or system's ability to acquire other competencies,* represent a flexible guiding mechanism for individuals as well as organizations, which acknowledge the synergy between gentle top-down mechanisms and robust bottom-up approaches.

A short review of literature on desired competencies in contexts relevant to complexity, for instance leadership of change and innovation, reveals that the common denominators are amongst others an emphasis on cognitive-, social-, and soft skills.

The next section will present the most essential aspects of the meta-competency model for leadership in complex military systems.

Chapter 8 – A Meta-Competency Model for Leadership in Complex Military Systems

The purpose of this chapter was to propose a novel meta-competency model for leadership in complex military systems.

Through a process of synthesis of three research designs, namely non-empirical literature study, empirical research and model building study, this dissertation suggests the following meta-competencies for leadership in complex military systems:

Heterogeneity of degree, androgynousity, cognitive flexibility, ethical reasoning, cross-cultural competence, intuition, identity and courage, all of which are discussed as they relate to complexity literature, complexity and leadership literature, military context and empirical evaluation.

This dissertation argues that the meta-competencies for leadership in complex military systems must be characterized as *interconnected* and *interdependent*, and the metaphor of a cloud is therefore presented as a suitable image of the dynamics of complexity and the co-existence between the meta-competencies.

The relevance of the meta-competency model for leadership in complex military systems is discussed using three different macro settings.

In the first macro setting it is argued that the meta-competency model for leadership in complex military systems has low to medium relevance in a micro context, medium relevance in a tactical and operational context and high relevance in a strategic context.

In the second macro setting this dissertation proposes that the meta-competency model has low to medium relevance to symmetrical and conventional conflicts and high relevance in asymmetric and unconventional conflicts.

In the third and final macro setting it is suggested that the meta-competency model is as highly relevant for the peace time management of military organizations in garrison, as it is for combat related field operations.

The list of literature is now presented.

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Annexure 1

PURPOSE OF THE QUESTIONNAIRE

The purpose of this questionnaire is to investigate social science theory and leadership, and how this is linked to military officers' general world view.

By participating in this study you will get the opportunity to communicate your perceptions regarding important leadership perspectives. The provided information can furthermore give valuable information for evaluation of the existing educational system in the Defense Force.

YOUR RIGHTS AS A PARTICIPANT

As a participant in this study, you have the right to;

1. decline participation
2. withdraw from the research at any time once your participation has begun.

There will be no consequences of declining or withdrawing from the study.

If further information about the research or your rights as a participant is needed, please contact roenn@hotmail.com.

INSTRUCTIONS

Your responses to this questionnaire will be treated as **anonymous and confidential** and will only be used for research purposes. Please answer **all** the questions.

The questionnaire is expected to take approximately 15 minutes to complete.

1. Please indicate your response to each question by encircle (or ticking the box) one of the alternatives provided, or fill in the answer where required. If you want to correct, please make an X over the false option and circle the new response.
2. There is statistically proven that respondents in general lean towards a central tendency, i.e. they answer on the middle of the scale. Please keep this in mind and make, if possible, choices based on preferences.
3. Please read the questions carefully and reflect for a moment before you answer.
4. The questionnaire is individual work and it is not allowed to cooperate.

Thank you for your participation. Your contribution is appreciated!

☐ **By ticking this box I agree that I have been informed of my rights in participating in this research and I give consent for the researchers to use my response for research purpose only**

ENGLISH-NORWEGIAN DICTIONARY

English	Norwegian
E.g.	For eksempel
Equilibrium	Balanse
Freedom of action	Handlefrihet
Trait	Karaktertrekk (personlighet)
Disperse	Spre
Deviate	Avvike
Subordinate	Underordnet
Facilitation	Fasilitere, legge forholdende til rette
Heterogeneous	Ulik, uensartet
Adapt	Tilpasse (seg), adaptere

PART 1 – DEMOGRAPHICS DETAILS

Please mark the appropriate option.

Current education

Stabsstudie ☐ 1

Masterstudie ☐ 2

Gender M ☐ 1 F ☐ 2

Age _____

Background Army ☐ 1 Navy ☐ 2 Air ☐ 3 HG ☐ 4 Civilian ☐ 5 Other ☐ 6

If other, please note _____

Please note the following: The use of the word "unit" refers to your level (project, department etc.)

PART 2

Please indicate on a scale to what extent you agree with the statements below, where 1 = Strongly Agree, 2 = Agree, 3= Uncertain, 4 = Disagree and 5 = Strongly Disagree.

Please encircle the appropriate option.

Q	***Statement***	***Strongly Agree***	***Agree***	***Uncertain***	***Disagree***	***Strongly Disagree***
1	I *usually* prefer working in groups consisting of many different personalities and cultures	1	2	3	4	5
2	I *mostly* prefer working in a harmonious work environment with little friction and disagreement	1	2	3	4	5
3	Long term - and detailed planning is *usually* creating good results in an organization	1	2	3	4	5
4	When I plan an operation or event I *usually* put much emphasis on trying to predict what will happen	1	2	3	4	5
5	To create an understanding of something I *often* only need to be given the statistics, objective figures and concrete facts	1	2	3	4	5
6	I believe that managing by objectives or goals *usually* is the best way to create success for my organization.	1	2	3	4	5
7	When I am analyzing a problem the best thing is to split the problem into smaller problems and solve each one of them independently. In other words, the whole = part+part+part etc.	1	2	3	4	5
8	I *usually* look at chaos in my organization as something negative and destructive	1	2	3	4	5
9	*Constant* change is *always* necessary	1	2	3	4	5

	for an organization to survive					
Q	***Statement***	***Strongly Agree***	***Agree***	***Uncertain***	***Disagree***	***Strongly Disagree***
10	Small actions *usually* create small effects. In other words, if I do little I create little	1	2	3	4	5
11	When I am leading my unit, *my most important* goal is to create or maintain control	1	2	3	4	5
12	I think that a unit *usually* is dependent on having a leader to achieve success	1	2	3	4	5
13	I believe that my organization is very much affected by external events and that it needs to *constantly adapt* to changing circumstances	1	2	3	4	5
14	The *most important thing* in order to achieve success as a leader in my organization is to be relationship-oriented	1	2	3	4	5
15	When I make a decision I *usually* base it on a thorough analysis taking all relevant facts into account	1	2	3	4	5
16	It is *usually not* beneficial for a group to have a heterogeneous composition	1	2	3	4	5
17	I *mostly* think of conflicts within a group as something good	1	2	3	4	5
18	Detailed plans, policies and strategies *rarely* work out as they were intended to	1	2	3	4	5
19	The assumptions one make of the future *often* turns out to be misleading	1	2	3	4	5
20	My experience is that statistics, facts and figures alone *rarely* give the necessary input to create an understanding of something	1	2	3	4	5

Q	***Statement***	***Strongly Agree***	***Agree***	***Uncertain***	***Disagree***	***Strongly Disagree***
21	I believe that a fundamental focus on processes instead of goals *usually* will be the best way to create success for my organization	1	2	3	4	5
22	I believe that splitting a problem into smaller problems and then analyzing them separately will create inaccurate results. In other words, the whole is greater than the sum of its parts.	1	2	3	4	5
23	I *usually* look at stability and balance in my organization as something positive and constructive	1	2	3	4	5
24	*Constant* change in the organization is *often not* necessary and have more negative effects than positive	1	2	3	4	5
25	Great effort *usually* creates great effects	1	2	3	4	5
26	When I am leading my unit, *my most important goal* is to create freedom of action, flexibility and independence for my subordinates	1	2	3	4	5
27	I think that a team in *many cases* can be more successful working without a formally appointed leader	1	2	3	4	5
28	I believe my organization *in most cases* should stick to the defined plans and strategies	1	2	3	4	5
29	The *most important thing* in order to achieve success as a leader in my organization is to be task-oriented	1	2	3	4	5
30	I *usually* make spontaneous decisions based on intuition	1	2	3	4	5

Part 3

Please indicate on the scale to what extent you agree with the statements below, where 1=Strongly Agree, 2= Agree, 3 = Uncertain, 4 = Disagree and 5 = Strongly Disagree.

Please encircle the appropriate option.

Q	***Statement***	***Strongly Agree***	***Agree***	***Uncertain***	***Disagree***	***Strongly Disagree***
31	Having insight and understanding of the people one lead and cooperate with is *the most important feature* of military leadership.	1	2	3	4	5
32	I think a leader should *often* create uncertainty and instability in the organization.	1	2	3	4	5
33	I think that innovation and creative thinking *usually* is the task of the leader, not the subordinates.	1	2	3	4	5
34	Military leaders get their power through the formal structure of the organization	1	2	3	4	5
35	I believe that a decentralization of control and responsibility *often* create poorer results	1	2	3	4	5
36	As a leader I observe events and intervene with corrective directions when the events deviate from the plan	1	2	3	4	5
37	In order to handle complex problems military leaders *should* have their main focus on the micro-level interactions between people	1	2	3	4	5
38	The *most important* function of a top-level leader is to provide *purpose* for the organization through the use of inspirational and expressive language	1	2	3	4	5

Q	Statement	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
39	For me, leadership is *in essence* directly linked to how I behave and what I say in front of my subordinates. In other words, my actions guide my subordinates' behavior	1	2	3	4	5
40	A shared vision and strong organizational values are the *most important* guiding principles to create success in my organization	1	2	3	4	5
41	I accept that processes within my organization create anxiety among the employees	1	2	3	4	5
42	I believe the following group of metaphors best describe my leadership style: Gardener, steward, servant, missionary, facilitator and convener	1	2	3	4	5
43	In order to manage uncertainty and unpredictable situations military leaders should *always* focus on developing the ability to *constantly* adapt	1	2	3	4	5
44	I believe the ability to think abstract and "outside the box" is the *most important* trait of a military leader	1	2	3	4	5
45	Having insight and understanding of the technical system one operate (e.g. a weapon's system or a platoon) is *the most important* feature of military leadership	1	2	3	4	5
46	When I am leading a task I *usually* try to minimize uncertainty and instability in my organization and create harmony	1	2	3	4	5
47	Instead of being the centre for innovation and creativity, a leader should *usually* prioritize to facilitate and encourage innovation among its subordinates.	1	2	3	4	5

Q	Statement	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
48	Military leaders get their power as a result of being recognized as a leader by the organization's members through the everyday interaction.	1	2	3	4	5
49	A believe that a centralization of control and responsibility *often* create better results	1	2	3	4	5
50	I think that leadership is an expression of the collective behavior of my organization where I, as a formally appointed leader am a *participant*	1	2	3	4	5
51	In order to handle complex problems military leaders *should* emphasize the use of complicated technical solutions	1	2	3	4	5
52	The *most important* function of a top-level leader is to articulate goals and provide good enough systems to reach the goals	1	2	3	4	5
53	For me, leadership is *essentially* about making it possible for sub-units or subordinates to solve their mission, for example through empowerment and facilitation	1	2	3	4	5
54	Well planned policies and regulations are the *most important* guiding principles to create success in my organization	1	2	3	4	5
55	If processes generate much anxiety in an organization, it is not worth it	1	2	3	4	5
56	I believe the following group of metaphors best describe my leadership style: Leader, director, boss, father, problem-solver, doer, pathfinder, navigator	1	2	3	4	5

Q	Statement	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
57	In order to manage uncertainty and unpredictable situations military leaders should focus on detailed planning and automatic responses	1	2	3	4	5
58	I believe that the *most important* leadership trait is the ability to follow procedures to solve a mission within the given resource framework.	1	2	3	4	5

Please mark the appropriate option or fill in where required.

Q59: Did you experience any difficulties in understanding any of the questions?: YES/NO

- If yes, which questions? _____

- If yes, what was difficult to understand?

Q60: Rate your own English language proficiency: From ONE (1) Not good - to FIVE (5) Native speaker

1	2	3	4	5

THANK YOU FOR COMPLETING THIS QUESTIONNIARE. YOUR PARTICIPATION IS APPRECIATED.

Annexure 2

To

Dean John Andreas Olsen

Norwegian Staff College

From

Harald Rønn June 8, 2009

APPLICATION TO CONDUCT SURVEY

Background

The researcher, Harald Rønn, is hereby applying to conduct a paper-based questionnaire at the Norwegian Staff College.

The researcher is employed by the Norwegian Armed Forces but is currently a full time student at the School of Public Management, University of Stellenbosch, South Africa.

The intent with the doctoral thesis (PhD) is to propose a *model for leadership education in complex military systems*.

The theoretical point of departure for the doctoral thesis is based on Complexity Theory, also widely referred to as Chaos Theory. Complexity Theory is a Social Science theory based on principles from the Natural Science theory of Quantum Physics. The core of Complexity Theory has, in contrast to more traditional theories, a focus on chaos (chaos-theory), disequilibrium and non-linearity as something nourishing and positive.

The non-linear and often chaotic nature of Military organizational life is what makes it particularly interesting to investigate from a Complexity Theory point of view. The international literature on the field of Complexity science emphasizes the enormous number of opportunities Complexity Theory offers the field of Defense related matters.

Discussion

An essential step in the development of the model for leadership education in complex military systems is a survey investigating the Norwegian Officers' attitudes towards Complexity- and Newtonian principles.

A survey was conducted at the Norwegian Military Academy in May 2009 were the intent was to clarify the lower-level officers' attitudes towards complexity principles. In order to get *representative and valid* data for the analysis, there is a need to gather data from a higher military educational institution. As such, the Norwegian Staff College is a highly, and perhaps the only, relevant institution to conduct the survey.

The groups of interest at the Staff College will mainly be Stabsstudiet and masterstudiet.

The questionnaire has already been developed, so the data collection can be conducted when the Staff College finds it suitable. However, due to the planned progression on this thesis, the researcher hopes to conduct the survey between mid June and September 2009.

The paper-based questionnaire takes approximately 15 minutes to complete.

The researcher emphasizes to give the educational institution proper feedback on the conducted survey and hope the institution see the potential benefits of participating.

Conclusion

The researcher, Harald Rønn, is hereby applying to conduct a survey at the Norwegian Staff College.

The development of the study uses Complexity Theory as a theoretical point of departure and the purpose of the doctoral thesis is to *develop a model for leadership education in complex military systems.* In order to develop the model an essential step is to conduct a survey at the Norwegian Staff College.

Please do not hesitate to contact me on phone +47 41 37 60 96 or by email roenn@hotmail.com if there are any questions. From the 1st of August I can be reached on phone +27 722 11 02 84.

The researcher is looking forward to your reply and is hoping for a positive response.

Kind regards

(sign)

Harald Rønn

Ansattnummer: 9433

Norwegian ID: 090879

Annexure 3

Thursday, May 07, 2009

Officer Commanding
Norwegian Staff College

RESEARCH TO BE CONDUCTED TOWARDS DOCTORAL THESIS (PhD)

Mr Harald Rønn, Norwegian ID: 09087935598 and employee number 9433 in the Norwegian Army, is currently a student at the School of Public Management and Planning, Stellenbosch University, South Africa.

It is expected that Mr Rønn, in order to complete the PhD, will have to complete a research dissertation in fulfillment of the requirements for this degree. In this regard we place a high premium on research that is practice based and, if possible, will make a useful contribution to knowledge of professional practice.

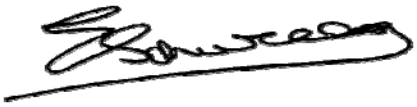
The intent with Mr Rønn's doctoral thesis is to propose a model for education in complex military systems. As such, the thesis will investigate the link between complexity theory and the Army, more specifically how complexity theory can be useful in a military setting and what attitudes the Norwegian military officers have towards complexity principles.

The researcher has also recently conducted a survey at the Military Academy in order to clarify the lower level officers' attitude towards complexity principles. The next step in the research is to gather data from a higher Norwegian military educational institution in order to get a stronger basis for the analysis.

As such, it will be highly appreciated if he can be allowed to execute a survey at the Norwegian Staff College. Although the nature of the research is not such that it will compromise military security, we are sensitive towards military restrictions and can make arrangements for the thesis to be classified for restricted access, should you consider it necessary.

Please feel free to contact me, should you need further information.

Yours sincerely



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Annexure 4

To

The Norwegian Staff College w/

Major Geir Karlsen

From

Harald Rønn

2 April 2009

GENERAL INFORMATION AND GUIDELINES FOR SURVEY

First of all, I would like to thank the Norwegian Military Staff College for the opportunity to make a survey and hope that the Military Staff College can make use of the results in the future.

This letter gives general information about the survey and some guidelines for the data collection that is important to follow to ensure data quality.

Background

The questionnaire is a part of my work on the Doctoral thesis at the school of Public and Developmental Management, University of Stellenbosch, South Africa.

The survey is an essential part of the Doctoral thesis and is the culmination of many months with research. I most therefore stress the importance of following the general guidelines described in this document to ensure high data validity and quality.

The purpose of this thesis is to develop a competency model for military leadership in complex military systems. This thesis thus investigates the relationship between Complexity Theory, its implications for leadership and general military activity.

Discussion

The discussion is divided into three main categories, general information about the survey, checklist for the day of data collection and what to do after data collection.

<u>General information about the survey</u>

1. The target group for the survey is the students/Officers attending stabsstudiet and masterstudie.
2. The number of respondents should be as high as possible, thus ensuring a representative basis for the analysis.
3. The survey is in English. There is a simple dictionary provided on the first page of the questionnaire.
4. The survey consists of 60 questions and will take approximately 15 minutes to answer (NB! There is no time limit)

<u>On the day of data collection</u>

1. Organize the Officers/students in a classroom or equivalent. Optimally all answer the questionnaire at the same time, but I understand that this may cause some practical challenges.

Please do not issue the questionnaire as “evening work” the one day and take it in the following morning, as this may cause considerable sources of error to the questionnaire.

2. Inform the Officers/students that:

    a. The survey is a part of the research for a Doctoral thesis.

    b. The Doctoral thesis investigates Social Science theory, leadership and military activity (NB! Do not mention the specific topic for the students, i.e. Complexity Approach, as this may cause bias). Keep it on a very general level. (page 1 on survey)

    c. The responses to the questionnaire will be treated anonymous and confidential and will only be used for research purposes (page 1 on survey)

    d. There is statistically proven that respondents in general lean towards a central tendency, i.e. they answer on the middle of the scale. Please keep this in mind and make, if possible, choices based on preferences (page 1 on survey)

    e. The questionnaire is individual work and that they are not allowed to cooperate (page 1 on survey)

    f. They must respond by circling the option. If they want to correct, please make an X over the option and circle the new response (page 1 on survey).

3. Show the students by using the overhead (or equivalent):

    a. That the survey is built up by statements and that the students must respond by circling either *strongly agree, agree, uncertain, disagree or strongly disagree.*

4. Issue the questionnaires.

5. Be present when the students fill in the survey.

6. If any abnormalities, please note it down as this can affect the analysis.

After data-collection

1. Please send the questionnaires with DHL to:

    Harald Rønn
    Robbertsz street 3 (Garden flat)
    Stellenbosch
    7600
    South Africa

    Phone number: + 27 722 11 02 84

2. A dispatch with DHL can be ordered at www.dhl.no or phone 81001345 (DHL express).

Conclusion

I appreciate the opportunity of making a survey at your institution and I am looking forward to inform the Military Staff College of the results.

I hope the general information and guidelines are satisfactory and that the practical data collection will go through without any major problems.

Please do not hesitate to contact me by mail roenn@hotmail.com or phone + 27 722 11 02 84 if there are any questions.

Kind regards

(sign)

_____

Harald Rønn

1st Lieutenant and International student, Stellenbosch University